THE FOUNDRY for March

Frederic B. Stevens

Frederic Beckwith Stevens, whose well rounded span of years covered many worthy accomplishments in business and civic affairs, occupied an unusual position in the foundry world. For more than fifty years he was an active and important figure, first through his association with a prominent Detroit foundry organization and then as a producer and supplier of foundry supplies and equipment. These stark facts fail to appraise the place which he held in the esteem of foundrymen throughout the world. He projected into his business a personality which all came to know and recognize with friendly respect. The period of his business activity saw the evolution of castings manufacture from a wide flung group of loosely scattered shops to a great organized basic industry. The vision and leadership of Frederic B. Stevens left its imprint and exercised an important influence throughout this period.

Mr. Stevens was closely associated with John A. Penton the founder of this publication at its inception. From the first number through forty-two years his firm's intelligent, forceful advertising appeared in every issue. Close as was this commercial relationship, it is transcended by the respect and fine friendship between Frederic B. Stevens and successive generations of THE FOUNDRY staff.

Will Need MANPOWER

PATIENCE and fortitude as exhibited by those men who have given the best of a lifetime of service to the foundry industry, holds promise of early reward. Improved foundry operations disclose a new situation. A period of at least four years has elapsed without adding to the available supply of trained, competent foundry executives and assistants. Meantime, the operation of fundamental actuarial and mortality laws has not been suspended. Discounting even the normal depletion which has resulted from the depression era, it is fair to assume that the need for such men will exceed the supply until such time as training and experience can catch up with the shortage. To these conditions is added the new plane of operation, the competitive relationships in castings manufacture from which some of the variables of the twenties have been removed. Stabilization of prices at better levels, the evening off of factors relating to hours, wages and production bring new demands upon foundry executives for ingenuity in planning and management. The new responsibilities, as always in the past, carry new opportunities.

And Again REHABILITATE

WITH the promised removal of obstacles that at present are imposed through credit conditions, the farsighted manufacturer in every line must meet the challenge of new conditions. Rehabilitation of plants and equipment is urgently required in many foundry establishments, where the margin between profit and loss may hinge upon economies in production. Obviously, for the period just passed any sort of alternative to the replacement of equipment was accepted through necessity. Depreciation alone has taken such toll that the operation of many types of machines in foundries constitutes a constant item of expense. When to this is added the lost time incident to breakdowns and repairs, the lack of efficiency due to age and the inability to produce good work and true work with worn out equipment, economy advises replacements. Further, inventive progress has been marked in all lines of machine manufacture and in this the foundry equipment industry stands well out in the lead in its field. The thinking foundry manager today is taking stock of what the new types of production aids can offer him. This is with no idea of replacing manpower, but in making it most effective in providing gray iron, malleable iron, steel and nonferrous castings for the long accumulating demand.

Fig. 1—Pouring a pump casing from two 180-pound shanks. As may be observed the gates are at opposite corners

Makes High Silicon Iron Castings

Solidification shrinkage and tenderness at red heat require special practices

By EDWIN BREMER

FOR years prior to 1912, chemical manufacturers in this country depended upon ceramic ware, glass, and in a few instances on certain metals, as materials from which to construct their apparatus and equipment. Those materials in the main suffered several disadvantages, such as lack of strength, length of time required for fabrication, etc., all of which handicapped the chemical industry to a considerable degree. However, in May, 1912 after about a year of experimenting, the first high-silicon iron castings were placed on the market in this country by the Duriron Casting Co., now the Duriron Co. Inc., Dayton, O. which successfully met requirements of the chemical industry.

The material which is called *Duriron* contains approximately 14.25 per cent silicon, a total of 1 per cent manganese, carbon and other impurities, and the remainder iron. It practically is unaffected by sulphuric, nitric, acetic and many other commercial acids of any strength and temperature. Hydrochloric of higher concentration has an appreciable action on the cast material but for use with that acid the firm has developed another alloy termed *Durichlor* which in addition to the high silicon content contains about 3.5 per cent molybdenum and 1 per cent nickel.

Both alloys show a grayish white structure on fracture, and are exceedingly hard so that they cannot be machined with tools, but must be finished by grinding. That is due to the formation of iron silicide instead of iron carbide, which also gives the acid-resisting properties to the high silicon iron. The carbon content, which is under 1 per cent, practically is all in the free state scattered through the body of the metal in thin

Fig. 2—Medium size pipe cores are swept up in loam over a hay-rope winding on the steel arbor

and rather fragile flakes.

High silicon irons of the Duriron Co. are made from bessemer ferrosilicon pig iron containing from 15 to 16 per cent silicon, 0.02 to 0.03 per cent sulphur; 0.08 to 0.10 per cent phosphorus; and 0.18 to 0.34 per cent manganese in conjunction with return high silicon scrap, steel scrap and gray iron scrap. Those materials are melted in one of two 15-ton reverberatory furnaces similar to those employed for making malleable cast iron and air furnace iron.

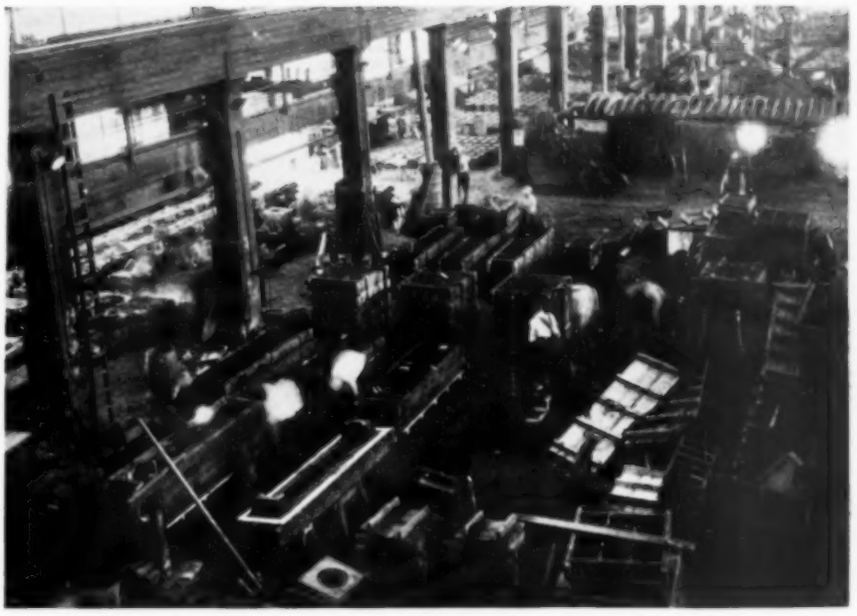


Fig. 5—A general view of the foundry showing the heavy molding floors in the foreground sanitary pipe shop in back and light floors at left

Furnaces used differ from the usual air furnace in that the roof is slightly higher and nearly level to keep the flame from being deflected onto the metal bath and thus prevent excessive loss of silicon through oxidation. Unless the melting procedure is controlled carefully, the metal becomes gassy and unfit for castings. In the early days it was deemed necessary to melt down the charge, pig it, and then remelt the pigs before pouring into castings. However, careful investigation developed methods to eliminate gassy metal without wasteful pigging, and the latter was abandoned.

As shown in Fig. 5, the two melting furnaces are located approximately in the middle of the foundry bay so that the molten metal does not have to be carried far for distribution. Metal is tapped into double hand-shanks holding about 180 pounds or into crane ladles ranging from 2 to 5 tons capacity. Tapping temperature is 2650 degrees Fahr., and the pouring temperature ranges from 2500 to 2550 degrees, depending upon the size of the castings. Tapping and pouring temperatures are observed by an optical pyrometer, and entered in a log book for reference.

Castings made by the firm range in weight from less than an ounce each up to 6500 pounds in the case of a 650-gallon kettle. While a certain amount of repetition castings such as sanitary pipe and fittings, valves, centrifugal and cylinder pumps, are made, a great many special castings designed for specific applications constitute a considerable portion of the production. In Fig. 5 the foreground is devoted to medium and heavy castings, the background to making sanitary pipe, and the portion of the foundry to the left of the row of columns is used for the manufacture of the lighter classes of castings.

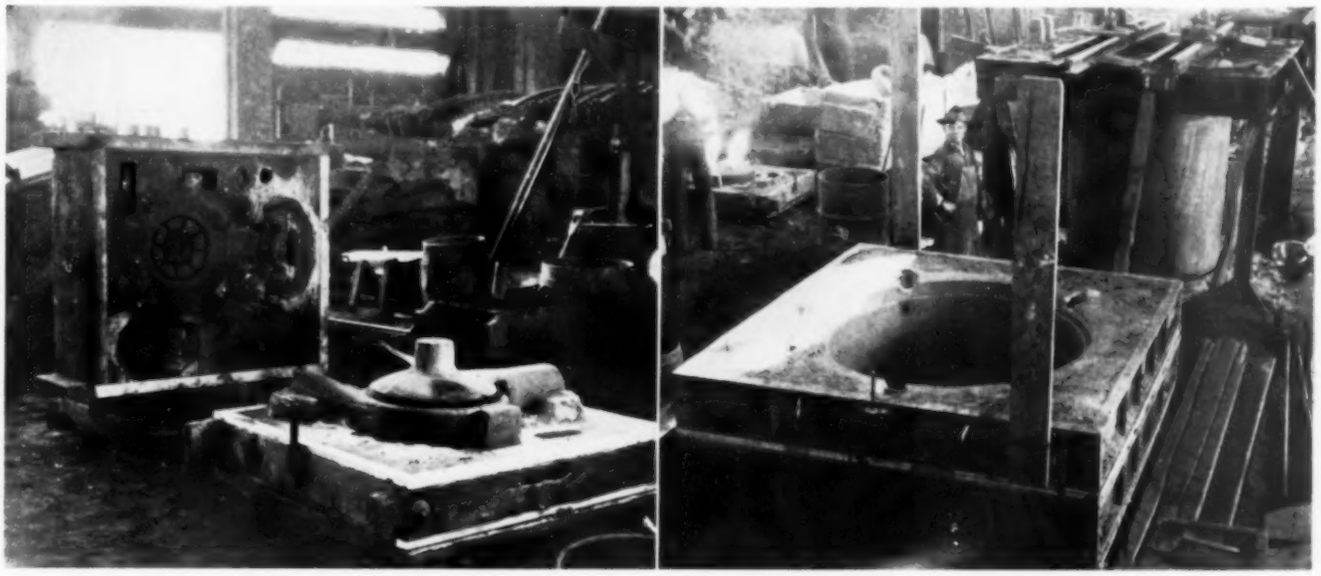


Fig. 3—Cope and drag molds for a pump casing with the cores in place. Ram-up cores form flanges at suction, discharge and neck. Fig. 4—Mold for a 650-gallon kettle which is gated at the bottom and near the top

Fig. 6—Cores for sanitary pipe 4 inches and under are made in halves which contain heavy rods

Production of high silicon iron castings is fraught with many difficulties, and even a foundryman with years of experience on other types of castings would be baffled by them. Previous mention that a year of experimental work was required before the Duriron Co. placed castings on the market is a cogent example of the study and investigation needed.

Metal Is Tender At Red Heat

High silicon iron can be made into practically any type of casting that can be produced in gray iron, although certain modifications usually are necessary. It has a contraction or pattern shrinkage of approximately 3/16-inch per foot, is fragile or tender at red heat, and begins to solidify at a comparatively high temperature. Consequently, those features must be considered carefully in designing castings to be produced in high silicon iron. Large plane areas must be avoided, and if possible, such areas should have a length from two to three times their width. The thickness should be from one-fifteenth to one-tenth of the shortest dimension of the plane. Sometimes in plane surface castings the center has a thickness of approximately 65 per cent of that of the edges.

Vessels always have a bead or rib around the top edge which gives a metal thickness at that point about twice that of the remainder of the casting. Holes for bolts, outlets, or other purposes usually are formed by dry sand cores, but in some cases where the hole diameter is less than the metal thickness, steel inserts are used for coring. That procedure is necessitated by the action of the molten metal cutting away the sand. Later, the steel inserts or cores are dissolved by sulphuric acid, leaving smooth, clean holes true to size in the casting.

Molds are made from green sand by hand, on squeezer-type molding machines supplied by the Federal Malleable Co., Milwaukee, Wis., and on a tractor-type sand-slinging machine made by the Beardsley & Piper Co., Chicago. Practically all special and large castings are hand molded, while the sand-slinging machine is devoted mainly to production of sanitary pipe ranging from 2 to 4 inches in diameter and 5 to 6 feet long, bell and spigot type. Dry sand cores generally are used, although in some instances dry sand drags with green sand tops and loam cores are employed. The dry sand cores are made so that a hard surface is produced, but with such a body that it disintegrates easily as the casting contracts.

Chaplets are not used to support cores since they would have to be of the same composition as the casting, otherwise the resistance to acid would be lost, and with this particular type of metal considerable difficulty is encountered in obtaining a satisfactory union or weld between the chaplet and casting.

Special Cores Requre No Chaplets

Consequently, the molding practice was developed to obtain support of the cores in other ways. The usual practice at that plant is to rod the cores sufficiently to obtain the required stiffness, and employ lock-type core prints to secure additional insurance against any shifting, twisting or movement of the cores. In general those core prints differ from the usual type in that they have much larger bearing surfaces, and often are rectangular in shape particularly where there is a tendency to twist, as for example in a 90-degree elbow. A group of cores shown in Fig. 7 indicate the (*Please turn to page* 40)

Fig. 7—A group of miscellaneous cores showing a wide variety and intricacy

Foundries Scan NRA Results

Early inventory shows potential benefits with attendant added burdens under code application

By DAN M. AVEY

INDUSTRY in general and in fact the entire American public is engaged in taking stock of NRA. In this a notable precedent was established by General Johnson in inviting, first a period of open criticism, and later a meeting of all code authorities to study, revamp and adjust such features of established codes as to make them most effective.

THE FOUNDRY anticipated this period and has sought and obtained a cross section viewpoint relating to the four codes embracing the main branches of the industry. The first of these to be approved of course was the steel foundry code followed soon thereafter by the malleable and a short period later by the nonferrous. The gray iron code was the last to be signed and it became effective Feb. 26. Accordingly, a sufficient time has not elapsed to permit a true evaluation of the effect upon many gray iron establishments, although adjustments were made in many particulars in anticipation of code provisions.

Codes Have Increased Labor Cost

Inasmuch as the National Industrial Recovery act repeatedly has been stressed as a means to decrease unemployment and to improve buying power through spreading and increasing wages, it is natural to consider this point first. Accordingly, a selected list of representative foundrymen throughout the country were questioned as to the direct effect upon the number of men employed and the payroll of such employes. Without exception an increase in the overall labor cost is noted, ranging from 10 to 56 per cent, with the majority reporting from 15 to 25 per cent overall advance in the labor cost of producing castings. With reference to the number of men employed, a diversity of effect is indicated and a few have stated that the influence of operation under codes may have been present but if so, it was indirect. In other words, the state of business in the foundry industry has improved and at the beginning of 1934 is at a markedly higher average than on June 15, 1933.

The specific question as to the number of men employed on June 15, 1933, and subsequent to February 1, 1934, elicited some interesting responses which are indicative of the wide diversity not only according to class of castings manufactured, but governed by locality and customer requirements.

For example, the following from among the steel foundrymen interviewed are typical:

Prior to June 15, 1933	Subsequent to Feb. 1, 1934
57	82
75	60*
181	239
45	58
138	175
200	450
31	37
58	97

*100 Men employed by this shop on Nov. 15, 1933.

Among malleable foundries the following are typical:

Prior to June 15, 1933	Subsequent to Feb. 1, 1934
65	50
49	55
140	115
84	134
123	164
120	200
150	250
95	150

Many malleable foundrymen remarked on having previously spread their work to the point that it was impossible to take on any more men by reason of low rate of operation. One who keeps a careful record of efficiency shows that the production per employe over the period mentioned has decreased 8½ per cent while piece rates have been advanced from 74 to 132 per cent.

Reports from nonferrous foundries identified with the automotive industry show tremendous increases in the number of men employed. However, among the smaller jobbing nonferrous shops the increase is much less marked. A few report a number added to the payroll, but state that it has been only through further spreading of work.

The situation in gray iron foundries although not directly traceable to the code provisions reflects in some measure the anticipation of what

the code would entail and also reflects the adherence in large measure to the President's reemployment agreement of the summer. Some have 40 or 50 per cent increase in total number of men employed over the two periods mentioned by reason of the PRA. A few of the gray iron foundries typical of the average reflect the number of employes as between the two periods as follows:

Prior to June 15, 1933	Subsequent to Feb. 1, 1934
33	43
114	151
303	364
59	67
41	32
141	144
20	18
330	422
62	68
60	90
60	54
69	73
125	143
61	84
80	87

A study of the overall labor costs on the part of a few individual foundries will be interesting and may be taken as fairly representative of the average. One steel foundryman says:

"While the rate of our men was only increased about 15 per cent, it has added considerably to the overall labor expense due to inefficiencies inherent with only operating a few days a week."

Even those shops which report that their hourly rates have not been changed by the codes indicate that the cost has increased. One such estimates this increase in cost to be 25 per cent. Another, a gray iron foundryman, gives an actual cost figure of $6.50 per net ton. A fair average throughout all branches seems to be in the neighborhood of 15 to 25 per cent increase in overall labor cost.

Price Situation Gives Concern

The price situation naturally gives much concern to all manufacturers. So much has been printed and said urging that manufacturers exercise every restraint upon advancing prices, that many have expressed open doubt as to whether it would be possible to obtain any increase even in those classes driven by notorious buying oppression to prices far the below cost. Some foundrymen have expressed the opinion that although hope was offered to the industry in framing the law that corrective measures would be permitted to cure the descending spiral of vicious prices, that now the application of the law as evidenced in the codes and the later interpretations and rulings on tentative plans for stabilizing prices, has played false with this hope.

The steel casting branch of the foundry industry which has had sufficient experience in the application of the code operation to price stabilization reports that there has been an advance in prices of from 10 to 20 per cent. It is significant that even with such advances the prevailing prices of steel castings range about 15 per cent below the 1926 prices of similar commodities.

In the malleable industry many report that prices obtainable are still below the cost of production. This is particularly stressed by smaller firms located at points remote from their principal market. A few malleable producers making specialty products and adhering to high specifications are obtaining from 20 to 25 per cent higher prices than during the summer of 1933. In these cases customers are willing to recognize the higher costs that are encountered.

Slight increases in nonferrous prices also are noted, but tending to follow more closely the advance in metal prices all of which, except copper, are higher. The advance is still inadequate where volume is not sufficient to spread the increased labor cost. The increases in ferrous metals range from 10 to 25 per cent, depending upon the location of foundries.

The change in gray iron casting prices is perhaps less marked than in any of the four major branches. An increase of $10 per ton in medium and heavy work and perhaps 10 per cent in light work seems to be average. All are hopeful that some effective means may be found to recover to the point where the increasing costs, at any rate, may be absorbed. Many are finding their most effective argument with reluctant buyers is to stress mounting material costs.

It is noteworthy that there have been abrupt increases in the prices of pig iron and scrap.

Malleable and gray iron foundries have encountered marked increases in fuel prices as well, one malleable foundry reporting on a coal contract an increase of over 100 per cent in price as compared with June 1933.

All report miscellaneous items of supplies as markedly higher ranging from 10 to as much as 200 per cent. A tabulation by a malleable foundry keeping close record, shows the increase in prices prevailing at present as compared with the summer of 1933. This tabulation follows:

	Per Cent		Per Cent		Per Cent
Sand	12	Malleable		Fuel Oil	33
Pig Iron	25	Scrap	34	Annealing	
Brick	26	Steel Scrap	38	Fuel	73
Core Oil	41	Coke	34	Melting Fuel	200

When questioned with reference to the influence of fair trade practice provisions a variety of opinion is elicited. A steel foundryman says:

"The use of the industry's unfair trade practice provisions has done some good and we firmly believe will be of great benefit when the industry gets to operating at a better percentage."

Another remarks that there are a few still attempting unethical procedure specifically at variance with code provisions. Many indicate that the foundries do not fully understand the importance of some of (*Please turn to page* 43)

Code Authorities Confer

Heads of foundry organizations protest any further attempt to reduce hours of labor

THREE major problems engaged the three day session of code authority members called to Washington for meetings March 5, 6 and 7. The first of these as stressed by President Roosevelt in opening the conference Monday morning was the possibility of shortening code hours and raising wages. The second was the whirlwind of discussion attending all sessions on trade practices, particularly those identified with open price provisions. The third, vital and immediate, concerned the matter of administering codes and emphasized the need for providing some means of raising the requisite funds for code authority expense and administration.

At the opening session on labor problems, Dr. A. J. Hettinger Jr., NRA research and planning division, gave bureau of labor statistics figures showing 880,000 unemployed in the consumption goods industries, 4,770,000 in the service industries and 6,040,000 in the durable goods and construction divisions. At least a 30 per cent reduction in hours would be required to relieve unemployment, giving as low as a 6 hour week in some industries. In response to a question by General Johnson, NRA administrator, Dr. Hettinger stated that in his opinion a 30 hour week would freeze the depression where it is. He is of the opinion that changes in the present set up should be made only after a careful consideration of factors in each code governing each industry.

Molders Now Are Scarce

At a succeeding session Deputy Administrator Brady proposed amending the heavy machinery and metal working codes to shorten the hours for common labor, where the greatest oversupply is said to exist and raising the limit on skilled and semi-skilled, if necessary to a 60 hour week on peak periods with time and one half pay for all over the 40 hour week stipulated in many codes.

Franklin R. Hoadley, president of the gray iron code authority, protested any attempt to further reduce hours of labor in foundries. He stated that molders are scarce and a further cut in hours with increased overall labor costs would drive many foundries out of business. R. R. Fauntleroy, president of the malleable foundry code authority, reiterated the dearth of semi-skilled and skilled men in the malleable industry. He pointed to the heavy financial losses in that industry, and with labor counting for more than 50 per cent of the total cost, stated that the increase which would be entailed would drive out malleable castings in favor of competing and cheaper materials.

Price Application Under Scrutiny

Open price practices came under a cross fire at the conferences on code fair practice provisions. The NRA has made no decision on open prices, but regarded the conference as an opportunity to develop opinion and testimony. Provisions permitting open price arrangements in various codes are not questioned, but their application is under scrutiny. Dr. Dexter Keezer, member of the consumers advisory board, holds that the consumer prefers open prices to secret tampering. Sidney Hillman, labor advisory board proposed an impartial government board to review all open prices. Division Administrator Whiteside presiding at the first trade practice session, stated that a sellers market is at hand and he inquired whether prices enabling 50 to 60 per cent of the industry to make a profit would be fair. He holds that open prices tend to eliminate the low price and produce higher levels. Industry is likely to be called upon to explain why filed open prices are identical while cost vary.

Herman Lind, National Machine Tool Builders association, stated that industry has heeded the admonition to maintain wages, but many who loyally have supported this phase of NRA have chiseled in their buying and oppress their purveyors. This results in the destruction of the wage scales of the latter. Prices which permit a profit are important to labor, to the consumer and to management alike. Buyers for the concentrated industries have an advantage at the present time, but open prices will enable industry to live.

He objects to manufacturers taking large orders below cost, hop- (*Please turn to page* 44)

Interior of the Convention Hall in Philadelphia where the 1934 convention and exhibit will be held

Plan Tour for Overseas Foundrymen

Delegates to International Foundry Congress will visit important centers before meeting

WITH European countries outstripping the United States in the march toward industrial and economic recovery, overseas foundrymen already are looking forward to visiting America to attend the Fifth International Foundry Congress and the Thirty-eighth Annual Convention and Exhibition of the American Foundrymen's association to be held in Philadelphia, Oct. 22 to 26. Interest thus far displayed indicates probably a larger representation of foundrymen from other countries than the exceptional group which attended the Third International Congress in Detroit in 1926.

The American Foundrymen's association now has well formulated plans for conducting the visitors to points of civic, scenic and industrial interest from the time they land in New York several weeks prior to the opening of the convention until they embark following the close of the meeting. In preparing the schedule for the preconvention tour, the committee in charge of arrangements has endeavored to include those cities which offer the greatest interest.

A tentative schedule for Tour *A* provides for a one or two day stay in New York following the arrival of the party from Europe. The delegates then will take a daylight ride through the beautiful Pocono mountains on the trip from New York to Buffalo, and will spend a day viewing Niagara Falls and points of interest in Buffalo.

From Buffalo, the party will proceed to Chicago where three or four days will be devoted to visiting the Century of Progress exposition. Detroit is the next stop on the tour, where the many important industries will offer excellent opportunities for plant visitation. From Detroit the party will go to Cleveland by boat, and will spend a day in Ohio's largest city. The following day will be spent in visiting plants in the Pittsburgh district. From Pittsburgh the party will go to Washington for two days of sight seeing in the Nation's Capital, before leaving for the Congress in Philadelphia.

Plans for the convention and exhibition are moving forward rapidly. Exceptional interest already is being manifest in the features of the exhibition of foundry (*Please turn to page* 43)

Distributing Molding Overhead

Calculating the cost by two different methods provides interesting results

SOME foundrymen advocate the use of molders' hours as a correct and usable basis for distributing overhead expense when calculating the cost of individual jobs. Others admit the molders' hours basis is correct in principle, but claim it is not practical for everyday use in jobbing foundries, so they preach and practice the use of dollars earned by molders as a basis for overhead.

The following discussion between Tom and Dick about the practicability of the two methods should help to solve the problem.

Tom is the accountant; a stickler for accuracy in charging expenditures to the proper accounts and an artist at preparing financial statements for the management.

Dick is the foreman of the molding department. Nature put a good head on Dick, but his academic education extended only to the eighth grade, when he entered a foundry as an apprentice molder, working his way up to a splendid foreman.

Results Show Many Variations

The dialogue takes place in the accounting department:

Dick—"Tom, I was talking to the cost man at Monarch foundry and he told me they figured their labor and overhead for molding jobs at so much an hour. Right away he got an argument as I have always been told that overhead should be charged to cost at a percentage of labor. I asked him if there was any difference in cost of the finished casting whichever way you figured it. He said they had made many tests by figuring both ways, and found that many jobs came close to the same figure, while many other jobs varied terribly. Tom, how do we figure molding overhead?"

Tom—"At 210 per cent of molding labor."

Dick—"Then you don't think much of Monarch's hour's basis?"

Tom—"Well, yes, the theory is O.K. but I don't think it is practical."

Dick—"Why isn't it practical? It always seemed to me that if a casting is worth while making at all, it's worth while making right. Don't that apply to figuring costs as well as to making molds? Of course, a poor molder can't produce a salable casting and maybe the same rule don't apply to accounting. The boss always blows about your accuracy, probably trying to hold you up as a shining example of efficiency, to the rest of us."

Tom—"That last remark should make me sore but I considered the type of long-eared animal that kicked me. But seriously, Dick, I must admit I never did take the time to figure costs on some castings of different types to see if there really was any noticeable differences caused by the way the overhead was figured. I have been told so many times by foundrymen and other accountants that it was not practical to apply overhead costs for molding on hours that I took it for granted that was the way to do it. Even a professional cost man told me the same thing."

Dick—"Say, I'm interested. Let's figure a few jobs both ways and see how we come out. Maybe we're passing up something."

Tom—"O.K. I'll get my departmental cost sheet for last year and let you see how I arrived at my percentage of overhead to labor. These are the operating accounts, and I think

Table I

Molding Overhead For Period of One Year

	Total Overhead	Per Cent Each Item To Total	Cost Per Hour Each Item	Cost Per Dollar Each Item
Depreciation	6633	920	0.11	0.19
Taxes	1210	168	0.02	0.03
Insurance	544	76	0.01	0.02
Interest on Investment	7408	1029	0.13	0.21
Maintenance	3582	497	0.06	0.10
Heat	629	87	0.01	0.02
Light	1479	206	0.03	0.04
Power	3930	546	0.07	0.11
Supervision	7409	1029	0.13	0.21
Pay Roll & Cost	1513	210	0.03	0.04
General Labor	19361	2695	0.34	0.57
Crane Labor	1573	216	0.03	0.05
Crane Expense	1245	174	0.02	0.03
Shop Clerk	1236	174	0.02	0.03
Supplies & Expense	5107	710	0.09	0.15
Sand	2474	343	0.04	0.07
Repair Defective Work	875	122	0.01	0.03
Pattern & Flask Expense	4435	617	0.07	0.13
Life Insurance	1353	181	0.02	0.04
Total	71996	10000	1.24	2.07
Direct Labor Hours			57891	
Direct Labor			34734	

Table II

Data Showing Variation in Methods

	Hours	Labor	Variance Amount	Variance Per Cent
The average day work molder (60 cents per hr.—8 hrs.)..	$9.92	$9.94	0.02	0
Skilled molder on day work.. (80 cents per hr.—8 hrs.)..	9.92	13.24	3.32	33
Piece work..... —8 hrs.....	9.92	14.49	4.57	46
Inexperienced molder..... (45 cents per hr.—8 hrs.)..	9.92	7.45	2.47	25

you know our chart." (Table I.)

Dick—"Yea."

Tom—"In the first column are the total charges for the year. I accumulated the direct labor hours for the year as the boss wanted to know the cost per hour of each kind of expense."

Dick—"I'll bet he is comparing my department costs with some other foundries to see if I'm on the job. Maybe some of them are like Monarch and figure on hours instead of labor. Leave it to him to do something like that."

Tom—"He did say something one day about our maintenance and supply expenses being lower per hour than the average heavy shop. Now get your thumbs out of your vest, he said you had too many men doing indirect labor and would have to pay you a visit soon."

Dick—"Thanks for the tip. I'll beat him to it and go into the matter first and get the drop on him."

Tom—"You give me the time on some job and I'll do the figuring."

Dick—"Let's take an average job first. For instance, one that takes an average day of 8 hours and an average molder."

Tom—"Here we are. I like to chart my figures as I can usually make the boss understand them quicker. He seems never to outgrow the habit of looking at the pictures first. The black portion indicates the costs of overhead on this job when figured on the hour basis while white section indicates results by using our method of per cent of direct labor." (Fig. 1.)

Dick—"I notice the cost of each element is the same."

Tom—"That is because it is an average job and our overhead as well as the hourly rates are figured on the average labor and overhead for the year."

Dick—"I understand, all our average jobs would figure out approximately the same way."

Tom—"It looks that way."

Dick—"I've got an exceptional molder that we pay 80 cents an hour. He does the fussy jobs on which the rank and file of molders lose too many castings. He quite often produces less tonnage in a day than the average. He has the same size floor as the rest. How would a chart of one of his day's cost look?" (Fig. 2.)

Tom—"See the cost bars are longer on the direct labor basis and you see we have established a 207 per cent rate that if applied to all jobs will take all our expenses in this year."

Dick—"Provided we have the same payroll as last year. By the way I see the charges for the different elements of overhead are greater in each case where distributed on dollars than where you used the hourly basis. Why's that?"

Tom—"Because the various items of overhead are increased in ratio to the increase of labor cost."

Dick—"You mean all these expenses increase

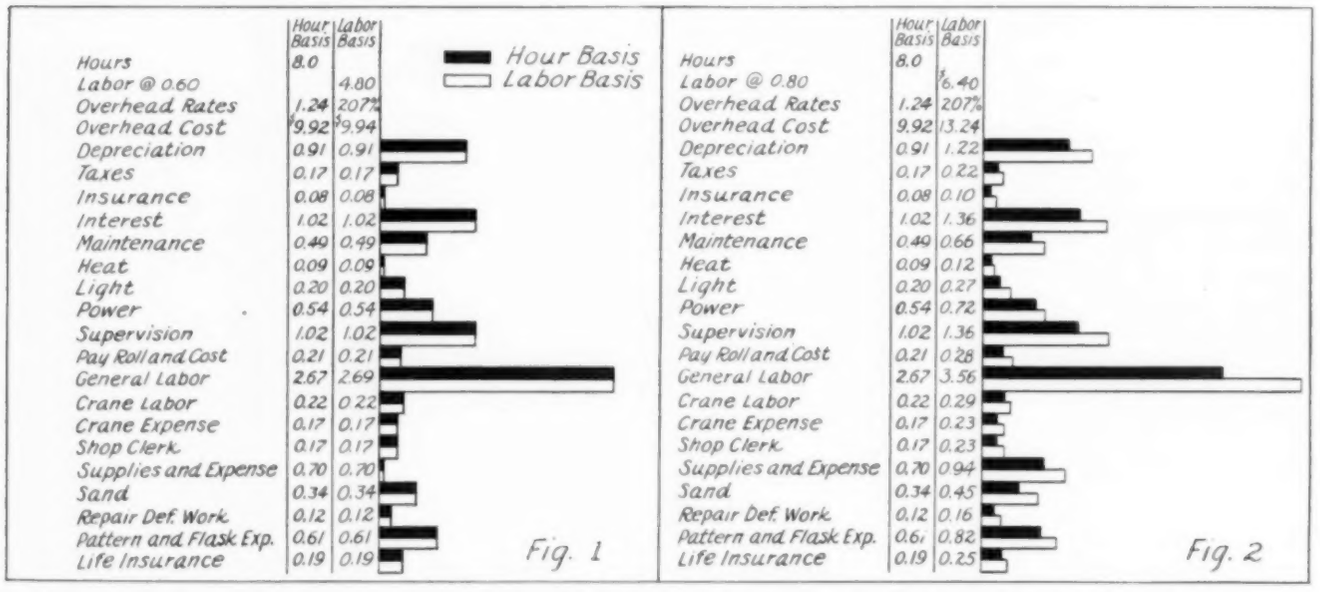


Fig. 1—Showing results of figuring molding overhead for one average molder on day work. Black indicated hour bases and white labor basis. Fig. 2—Same as Fig. 1 for one skilled molder on day work

because I pay this molder more money?"

Tom—"That's the case, isn't it?"

Dick—"I should say not! I can't see a single item that would increase because I pay that molder more money than the average in the department; some of the larger items, depreciation, interest, supervision, etc.—"

Tom—"We call them fixed charges."

Dick—"As I started to say, these would go on just the same regardless of whether this molder produced 100 pounds or 1000 pounds of good castings. In fact, wouldn't these items go on if he should be away and no production obtained?"

Tom—"That's right."

Dick—"But we increase these fixed cost figures on this molder's jobs because we pay him more money."

Tom—"Well, that's the way our system does it and there are a lot of foundries doing the same thing."

Dick—"I don't care if they do, the method is not right."

Tom—"These foundrymen admit it, but say it costs so much to collect the hours on each job for so little difference in cost."

Dick—"I see by the sheet that using the hourly basis, which they admit is correct, the cost is $9.72 and the cost by using the dollar basis is $13.24. Let's see, that's a difference of $3.32 or 33 per cent."

Tom—"That is quite a difference."

Dick—"I am convinced that Monarch knows what they are talking about."

Tom—"You have a lot of jobs on piecework. Do any of the molders work part day work and part piece work?"

Dick—"More than half of them are on piece work."

Tom—"Do you have a piece work job in mind that would show the effects of the two methods on molding overhead cost?"

Dick—"Yes, one that is in the sand for days at a time. The molder averages about $7.00 for an eight-hour day."

Tom—"All right, Bill, here is the chart." (Fig. 3.)

Dick—"That shows up about like the last one. We gated this job so that he gets the added production in the same floor space so it don't take any more of those fixed charges you tell about than if we paid him day work for less production. Neither do we put on any more flunkies to help with the iron and clean up when this job goes into the sand."

Tom—"I notice quite a number of molders names on the payroll that get around 45 cents per hour. Don't they get out as many flasks as the regular molders?"

Dick—"Yes and no. You see we have considerable work come in that is so easy anybody can mold. Why put an experienced molder on that work?

Tom—"I notice all the charts we have been working out show results where the molders earn more than the average. Let's work one at 45 cents per hour." (Fig. 4.)

Dick—"Tom, let's set up these four jobs so we can measure, in percentages, the variations in molding overhead costs between the hour and labor method."

Tom—"O.K." (Table II.)

Dick—"Some difference. Did you say the principle of distributing by hours is correct but there was not enough difference in results to pay to go to a lot of expense to do it right?"

Tom—"Well, yes, I did accept that theory as I told you when we started this analysis. But, in the face of these figures, I must confess I was wrong. Now (*Continued on page* 49)

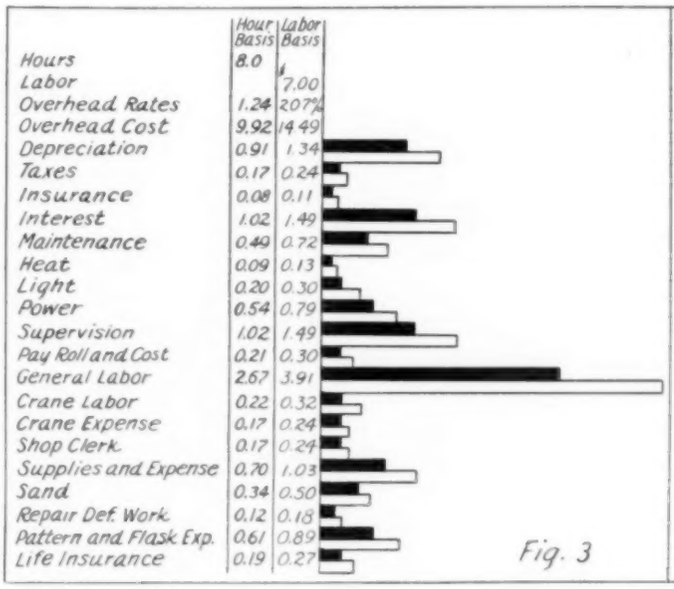


Fig. 3

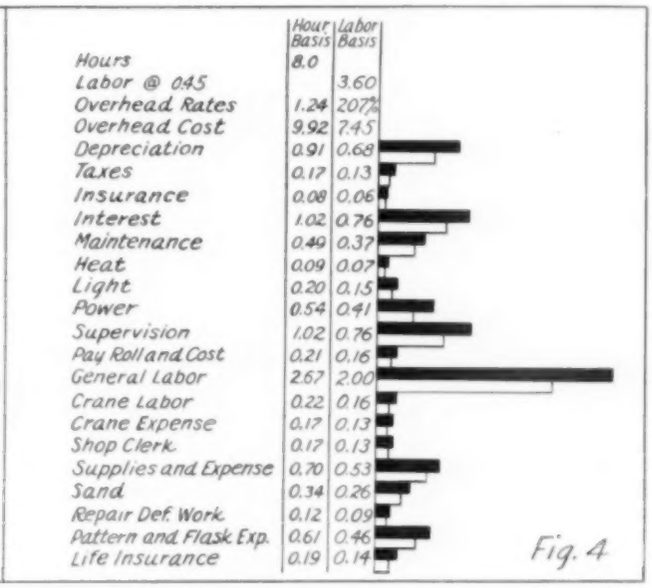


Fig. 4

Fig. 3—Showing difference in figuring molding overhead for one molder on piece work. Black indicates hour basis and white labor basis. Fig. 4—Same as in Fig. 3 for an inexperienced molder

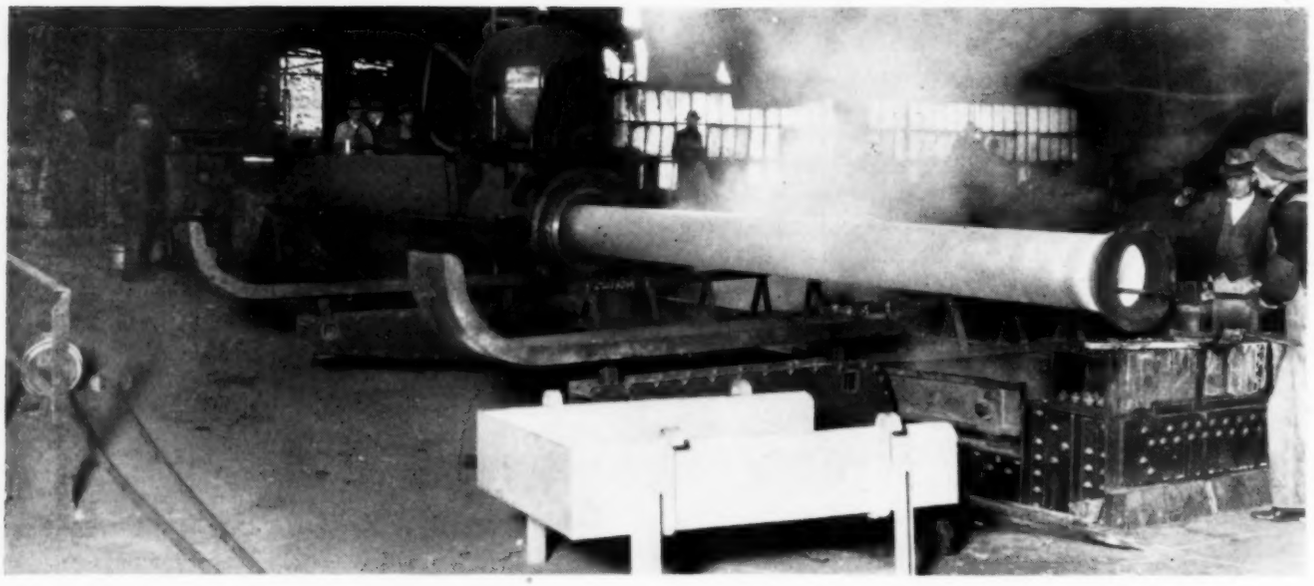


Fig. 1—Eighteen foot section of centrifugally cast pipe being removed from the mold. When free of the machine, it is carried by crane to the annealing oven

Iron Pipe Mold Coated with Powder

New process prevents chilling and increases impact resistance of centrifugally cast pipe

By B. K. PRICE

A PROCESS for producing unchilled cast iron pipe centrifugally in metal molds recently has been developed by the United States Pipe & Foundry Co., Burlington, N. J. This improvement in product is accomplished with only one additional step in the casting practice and without delay in the routine. Among the greater advantages claimed for the new pipe is an increase of more than 100 per cent in impact resistance, greater ductility and toughness, easier cutting and tapping, greater carrying capacity and lower cost per foot installed.

The key to this improvement is the application of a pulverulent material with a carrier gas, onto the surface of the metal mold immediately preceding contact of the iron stream. The pulverulent material is sufficient to retard the heat abstracted from the molten metal by the mold long enough to prevent formation of chill.

The feeding device is operated by a small electric motor with a built-in gear reduction unit, over which is mounted a stationary vertical cylinder, approximately 15 inches high, 4 inches in inside diameter. A rotary disk is on the bottom of the cylinder and an agitator is mounted in the center of the disk. The disk and agitator cause the column of powder to rotate as a unit, and with each revolution, a knife located inside the cylinder pares off a constant amount of powder, which is fed into an atomizing gun.

Distributes Gas and Powder

Here the powder is picked up by a carrier gas stream, in which the powder becomes suspended. The powder is then carried through a spray lance, or conduit, on the end of which is a distributor nozzle, which changes the direction of flow and distributes the powder and carrier gas over the face of the rotating mold.

The nozzle, about 6 inches long, is a perforated hollow cone, and is attached to the trough of the casting machine over which the mold moves. The length of the nozzle is so proportioned that the entire interior surface of the mold is coated uniformly with the layer of powder and absorbed gas.

The development of the process came after

innumerable experiments both with regard to insulating materials and manner of application. In the case of the previously mentioned nozzle alone, 157 types were tried out before deciding upon the present pattern.

Experimentation first started with liquid washes, but this retarded production, for in each case a certain delay was necessary while the liquid dried. Sometimes, too, the wash would burn into the mold. Then various dry powders were tried, but the method of application proved difficult. The salt shaker method did not give even distribution, nor was it possible to distribute the powder lightly enough. Further, it also slowed up the operation. Hence, it was necessary to center considerable attention on means of conveying the powder before a satisfactory method was developed.

Reduces Annealing Temperature

While the annealing is much the same, it was found advantageous with the unchilled pipe to reduce the temperature and to allow the pipe to remain in the oven slightly longer than under previous practice.

The basic metallurgical change, which eliminated the chilling of the pipe, and this improvement in annealing technique has been standard practice in the centrifugal pipe units of the company for more than a year, and has been patented. Coincident with public announcement of the new process is the initial operation of a super deLavaud unit at the Bessemer, Ala., works. This unit replaces a portion of a sand cast pipe turntable shop originally built in 1915, and consists of four 4 to 12-inch and one 14 to 24-inch machines for the manufacture of pipe with 18-foot laying length. A general view of the operating floor is shown in Fig. 2.

The machines are supported on a rugged operating floor and under this floor is a basement of unusual height, which permitted housing of all of the piping systems—air, steam, low and high-pressure water and afforded excellent access to all parts of the five machines.

Cupolas Provided With Forehearths

For furnishing the necessary iron, two 108-inch cupolas, originally used for sand cast operation, have been rebuilt and provided with a forehearth to better condition the iron for the purpose intended.

Iron from the forehearth is passed directly into the pouring ladles. These ladles are conveyed to the respective machines by an overhead traveling crane, the runway of which was an added piece of construction in the remodeling of the shop. This crane spans half the width of the building—the other half being spanned by a similar crane. This latter crane is used in taking the pipe, after being cast, to the charging end of the annealing furnace. Fig. 1 shows the pipe being drawn from the mold and Fig. 4 the pipe entering the annealing furnace.

The sockets are made of sand and are used in centrifugal machines for forming the bell end of the pipe. A complete (*Please turn to page* 46)

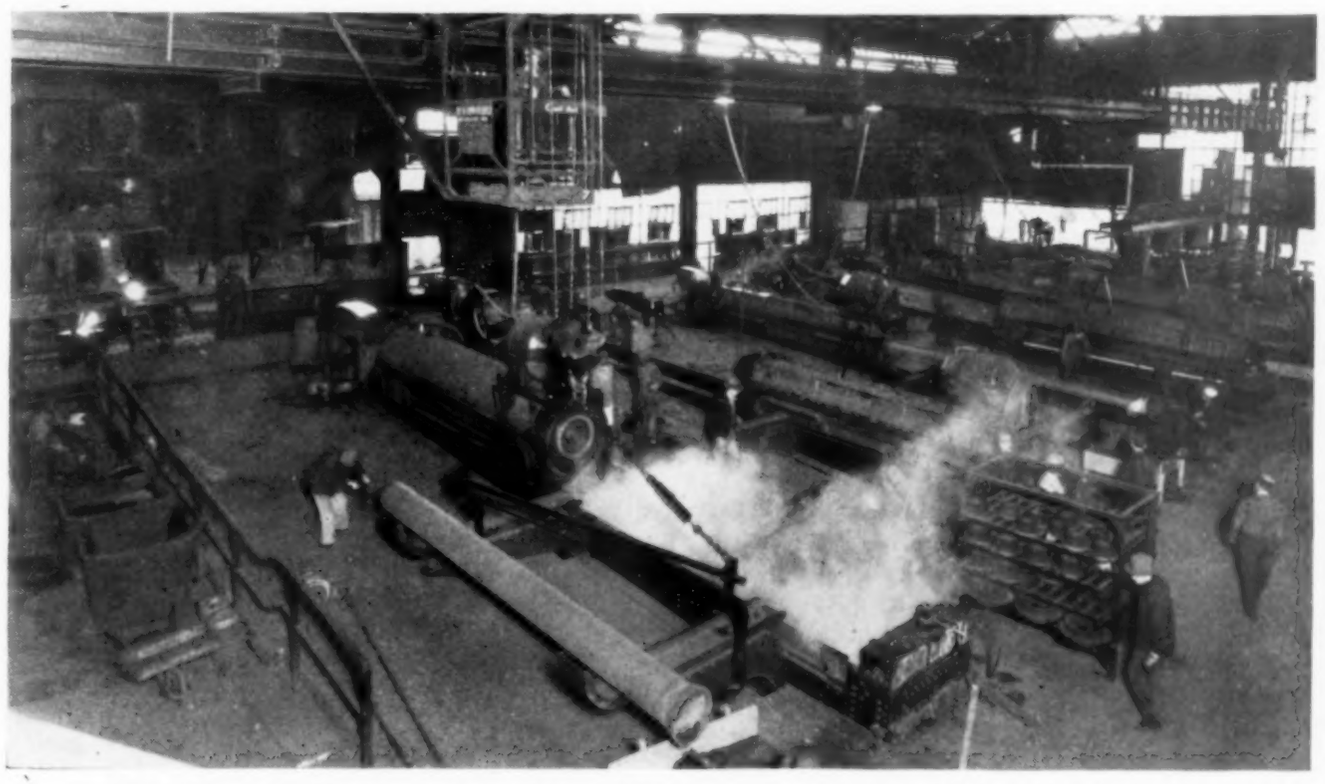


Fig. 2—General view of the operating floor showing a mold being poured and a pipe which has just been taken from the machine and placed on skids in the vicinity

Pouring Temperatures of Bronzes

Important factor influencing mechanical and metallurgical properties of casting

By EDMUND R. THEWS

POURING temperatures are doubtlessly most important of various factors influencing the quality of bronze castings. It is obvious that attainment of good metallurgical and mechanical properties also is dependent on a number of other factors such as quality and mixing of the alloying constituents, correct melting and pouring conditions, etc., but slight variations of these values do not affect the results nearly as much as corresponding deviations from the optimum casting temperatures.

Direct influence of casting temperatures on mechanical properties of bronzes may be modified considerably by special casting processes such as chill-casting which, besides offering a number of direct advantages, permits the various benefits of high casting temperatures (fluidity, sharp outlines of casting etc.) to be fully evaluated without sacrificing the excellent mechanical properties otherwise obtained only with low-pouring temperatures.

According to a generally accepted foundry rule best bronze castings are obtained where casting temperatures are maintained as low as the various practical considerations involved may permit. The chief disadvantages of comparatively high casting-temperatures are as follows: Coarse structure; porosity due to absorbed gases and to shrinkage; pronounced liquidation phenomena in practically all cases.

It will be shown that the reverse may be claimed with practically equal emphasis. There are optimum casting temperatures for bronzes as well as for all other metals and alloys. These temperatures are determined by the composition of the metal, melting and casting conditions and by the casting process involved. Casting below the optimum temperature in question is as disadvantageous as exceeding it, that is to say, it is practically impossible to state whether 100 degrees Fahr. too much tends to deteriorate the general qualities of bronzes more seriously then a casting temperature 100 degrees Fahr. below optimum. Published results of many experiments with numerous different bronze mixtures have not pointed to any general rule, so that the only justification of the one-sided position taken by many may be seen in the tendency of most founders to cast their alloys at too high temperatures, often in the neighborhood of the normal overheating temperatures.

Influence of pouring temperature on the structure of bronzes exerts itself chiefly in the determination of the size and type of crystals and of the porosity of the castings. It hardly seems necessary to explain the connection between pouring temperatures and grain size. Suffice it to say that, disregarding minor contributory causes and effects, grain size of the casting varies directly with the difference between pouring temperature and the freezing temperature

Table I

Freezing Ranges With Tin Varying

Tin Per Cent	Freezing Range, Degrees Fahr. Slow Cooling	Rapid Cooling
2.5	135	(255)
5.0	250	(310)
7.5	300	(345)
10.0	330	(355)
12.5	335	(345)
15.0	300	
17.5	250	
20.0	175	
22.5	105	
25.0	95	
30.0	70	

Table II

Typical Analysis of Tin Sweat in Bronze Castings

Sample	Copper Per Cent	Tin Per Cent	Composition Lead Per Cent	Zinc Per Cent	Phosphorus Per Cent
Bronze alloy	89.0	9.35	1.24	1.20	
Tin sweat	77.1	17.36	4.48	0.76	
Bronze alloy	88.03	10.70	0.33	0.46	0.16
Tin sweat	80.26	18.24	0.77	0.16	0.41
Bronze alloy	87.88	10.23	0.87	0.41	0.44
Tin sweat	78.82	19.29	1.40	0.29	0.92
Bronze alloy	86.11	12.54	0.21	0.16	0.89
Tin sweat	77.18	20.37	0.33	0.12	1.75
Bronze alloy	87.50	10.60	0.15	0.30	0.40
Tin sweat	80.90	18.20	0.46	0.15	0.74

of the bronze. The method of casting employed (chilled or sand casting) does not modify this rule in any way unless incorrect criss-cross comparison is being made between these two methods. Now, since best mechanical, physical and chemical properties are obtained with finely grained bronze castings, it appears that pouring temperatures should be maintained as low as is compatible with the other factors of importance. If comparatively hign pouring temperatures are desirable, chill casting is to be used.

Influence on Porosity of Metal

Influence of pouring temperatures (or rather, of the freezing period) on the porosity of the castings may be explained as follows:—On filling the molds the freezing temperature first is reached at the surface of the metal, advancing more or less gradually toward the interior of the casting, the speed and uniformity of progress depending on shape and weight of the castings. If the metal possesses one definite melting point (as for instance a pure metal) a dense, uniform wall of solidified metal grows toward the interior of the casting while in an alloy solidifying through a freezing range only part of the surface layer commences to solidify, the fused remainder freezing gradually later on, some of it only after the wall of frozen metal has advanced far into the interior of the casting. Thus, we have a semisolid casting consisting of a solidified dendritic network and containing a system of innumerable hollow channels and pores filled with molten metal. Since the volume of the solidified metal is being reduced by primary and secondary shrinkage, hollow spaces continually are formed which during the first period of solidification are filled up almost immediately. Later on the pores and channels are clogged up rapidly by freezing particles, isolating the hollow spaces farther back from the circulating fluid metal.

It is obvious, therefore, that the shorter the freezing range of an alloy, that is to say the smaller the difference between the freezing temperatures of the various constituents of the alloys, the more uniform and dense will be the castings produced. The hollow-spaces remaining after the freezing of the high melting constituents are not situated as far from the hot interior and the connecting channels and pores are shorter and less likely to be clogged.

Apart from the finely divided porosities produced by the gradual closing of connecting channels there are the larger cavities which are to a large extent caused by incorrect construction of the molds (faulty spacing of heavy and light sections etc.) although the freezing range of the alloys also may be contributory factors.

The freezing range of bronzes may be reduced in three ways: Employing suitable alloying compositions exhibiting comparatively narrow freezing ranges; production of chill castings by the use of chill plates etc; casting at reasonably low temperatures. Table I gives the freezing ranges of binary bronzes of varying tin contents.

Table III

Total Shrinkage of Some Copper Alloys

	Per Cent	Pouring Temp. Degree Fahr.	Total Shrinkage Per Cent Sand-	Chill Cast
Phosphor Bronze				
Copper	90.00			
Tin	9.75			
Phosphorus	0.25	2100	1.392	1.442
Some Iron and Antimony as impurities.				
Roller Bearing Bronze				
Copper	75.00			
Tin	11.00			
Lead	13.00			
Zinc	1.00	2050	1.375	1.416
Antimony and Iron as impurities.				
Zinc Bronze				
Copper	87.00			
Tin	8.60			
Zinc	4.30	1950	1.400	1.530
Lead, Iron and Antimony as impurities.				
Tomback				
Copper	90.00			
Zinc	9.93			
Lead	0.04	1940	2.016	2.075
Iron	0.02			
Phosphorus	0.01			
Brass I				
Copper	62.00			
Zinc	37.84			
Lead	0.10	1920	1.466	1.776
Iron	0.05			
Phosphorus	0.01			
Lead Brass II				
Copper	58.00			
Zinc	39.20			
Lead	2.50	1850	1.675	2.225
Iron	0.20			
Aluminum	Trace			
Durana metal				
Copper	59.00			
Zinc	40.39			
Iron	0.40	1920	1.641	2.000
Lead	0.20			
Phosphorus	0.01			

The table indicates that the freezing ranges are strongly influenced by the speed of cooling. The more rapid the rate of cooling of the castings from the liquid to the solid state, the wider the freezing intervals.

Addition of other alloying constituents, even in comparatively small quantities, will modify the freezing range in one or the other direction. Phosphorus, for instance, tends to widen this range. While with one of the common binary tin bronzes the freezing interval extends from 1810 to 1470 degrees Fahr. that of a corresponding phosphor bronze ranges from 1760 to 1150 degrees Fahr. The common liquation phenomenon known as tin sweat is due to this fact.

Tin sweat consists chiefly of the delta eutectoid forming alloy and is most common and most pronounced with large bronze castings rich in tin and containing phosphorus poured at comparatively high casting temperatures. A few typical analyses of "tin sweat" taken from *Metal Industry*, London Dec. 26, 1924 are in Table II.

The table indicates that in spite of its white or gray color tin sweat does not consist of tin—as some people still persist in thinking—but of an alloy enriched in tin, lead and phosphorus of comparatively low (*Please turn to page* 52)

Cast Iron Building Serves for Over Sixty Years

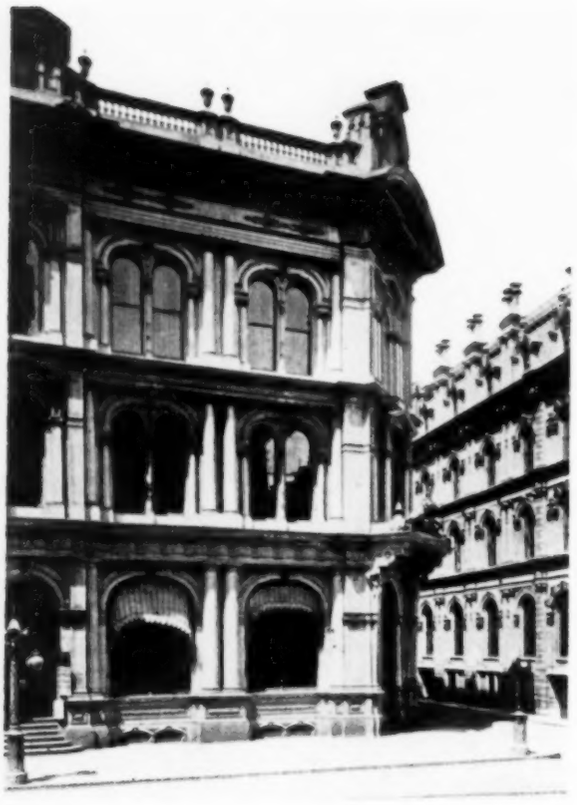


Fig. 1—The cast iron building in San Francisco as it appeared in 1872

AN INTERESTING building with walls and facade as well as trim and columns constructed entirely of cast iron, is described in a recent issue of the *U. S. Piper*, published by the United States Pipe & Foundry Co., Burlington, N. J. The building was constructed at 450 California street, San Francisco, in 1873, in what was then and is now the center of the financial district. The building housed the London & San Francisco bank, and was three stories high.

Some years later, a fourth story was added to the structure and it became the property of the Bank of California, who leased it to the Canadian Bank of Commerce. Today it is the property of the American Trust Co.

On April 18, 1906, the great San Francisco fire began. The earthquake which preceded it razed many of the flimsier structures, but the damage which occurred was due to the fire which followed. Thousands of buildings, hundreds of lives and approximately $500,000,000 in losses were sustained. But the cast iron structures at 450 California street was neither razed by the seismic disturbance nor destroyed by the fire which followed. True, its interior was gutted by the fire, but the sturdy cast iron walls withstood the terrific heat of the conflagration which dissolved the marble, shattered the granite and deformed the steel of the buildings on all sides. When the fire was over, the great cast iron structure was still there, smoke grimed and dirty, but staunch and invincible, a monument to sturdy construction and the rugged materials of which it was built.

The building still is there, at 450 California street, on the corner of California and Liedersdorf streets, in the heart of San Francisco's financial district. The interior has been reconstructed of steel, cement and brick, so that it is a Class A fireproof building. This remodeling was designed by Messrs. Burnham, of Chicago, and Willis Polk, of San Francisco, following the great fire.

The design of the structure is intricate in its detail, a tribute to the master craftsman of the period. Gargoyles, rosettes, acorns, wolves' heads and cornices are all of cast iron. Fig. 2 shows the twin figures of Atlas supporting the facade, which is an intricate casting worthy of the highest artistic praise. The manufacturer's plates, which are located at the bottom of the pillars on each (*Please turn to page* 52)

Fig. 2—Gargoyles, rosettes, acorns, wolves' heads and cornices are of cast iron

Foundry Salesmen in the Making

Ideal man should have shop experience plus essential qualities of salesmanship

By ERIC N. SIMONS

THE president of a large wholesale house once said to me: "If a man can sell soap successfully, he can sell anything, from corn to candles. What matters is not the thing you sell, but salesmanship." To some extent that was a true statement, but like most of its kind, it was a half-truth. Without sales-making ability, one cannot sell anything. But there is a big exception to the general rule that a good salesman can sell everything. That exception is the important class of articles known as the products of the foundry.

You can take it for granted that more than salesmanship is needed to sell castings. The man who is brilliant at selling general goods is quite likely to break down when it comes to selling foundry products. The reason is obvious. When selling soap, for example, or books, or anything that the man in the street or his wife uses, one appeals on the strength of certain factors such as appearance, color, taste, smell, price, etc.

Taken broadly, the emotional appeal, the appeal to personal idiosyncrasies, to feelings and whims and moods, is more suitable to selling articles of common use than it is to selling specialized materials or things. That is why the man who can sell jewelry can, without more than a few weeks' training in trade terms and talking points, successfully sell radios.

Art Stirs the Imagination

In both instances, the art of salesmanship is to stir the imagination, to make the prospective buyer realize how attractive the jewelry will look arrayed on her person, or the radio in the home; to point out how great a source of envy (or amusement) it will be; to stress the charms of jewelry in itself (or of music), and so forth.

What influences the buyer is not a description of the technical excellences of the jewels' setting or cut, or the underlining of cabinet-making ingenuities in the radio. The salesman may know these facts, but seldom will it be necessary for for him to use them. His energies will be devoted largely toward creating direct personal desire for possession.

This hardly ever is the case with castings. In selling these, the salesman has to dispense altogether with the strictly emotional appeal. He cannot hope to make sales by portraying the beautiful appearance of the castings, the aesthetic attraction they will lend to the workshop, the social asset of owning a spur gear, and so on. From first to last, he must argue, reason, convince by sheer unanswerable logic combined with an imposing array of facts. Rhetoric becomes mere waste of time. One does not sell foundry products by creating glamour.

Salesman Requires Technical Knowledge

Another point is that in almost every place in which castings are bought, problems of use and purpose differ. For that reason it is not enough merely to know by heart a number of stock arguments or talking points. Every firm called upon is likely to have a particular use, different from all others, for the the castings, and probably will want different castings. To adapt himself to all these requirements, the salesman requires considerable technical knowledge.

Let an example illustrate the point clearly. There are several different types of material for lining tube mills for rock grinding including quartz, chromium alloy steel, manganese steel, chilled iron, etc. Therefore, the steel casting salesman must be ready to answer with accuracy and promptness questions of great technical importance. Can he supply chrome steel castings as well as manganese steel? What is the length of life of chromium steel as compared with chilled iron? Will manganese steel spread under the pounding action of the steel grinding balls? Does he recommend chromium steel or manganese steel?

Of course, there are problems which even the best trained foundry salesman is unable to answer at once. Nevertheless, he must have it in his power to convince the buyer that, even though he is not, himself, a castings expert, he knows what he is talking about and has done more than commit to (*Please turn to page* 55)

Questions and Answers

Covering important problems found in all phases of modern foundry practice

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the following advisory staff: Steel, John Howe Hall; Malleable, H. A. Schwartz; Gray Iron, John W. Bolton; Nonferrous, N. K. B. Patch.

Changes in Cupola Diameter Affect Temperature of the Metal

With an ordinary fire brick lining we always had hot iron from our 28-inch cupola. Recently we relined the cupola with a special brick which the makers claimed would last much longer than the usual fire brick. This claim has been substantiated, but unfortunately the iron is not as hot as under the former conditions although none of the other factors, iron, coke, or blast, has been changed. Our cupola man claims that the bricks are responsible.

Your cupola man is right in his conclusion, but mistaken in his assumption that the composition of the brick is responsible for the cold iron. Under former conditions the fire brick lining burned back a couple of inches during the heat so that instead of a 28-inch diameter melting zone you had a 32-inch melting zone, probably the ideal area for the charges of coke and iron and the volume and pressure of the blast supplied by your fan. The new brick lining does not burn to the same extent, therefore the former charges are too large for the reduced diameter of the cupola.

The obvious remedy is to reduce the weight of the charges and—possibly—make some adjustment in the blast pressure and volume until you again secure iron at the desired temperature. Since the iron under former conditions was satisfactory we naturally assume that your cupola man is competent and is familiar with the detail of making and lighting the bed coke and of seeing that it is burned through properly before adding the top layer for the first charge of iron.

The cupola should be filled to the charging door and the coke should be allowed to burn under natural draft for approximately an hour before the blower is started. Coke varies in weight and composition, depending upon the coal from which it is made, therefore no positive rule can be given for the ratio of coke to iron by weight. However, a layer of coke between 4 and 6 inches thick is approximately correct between iron charges. Large lumps may be used for the bed, but the coke should be broken to egg size for the splits. Begin with 500-pound iron charges and gradually increase them from day to day until the resulting molten iron shows a drop in temperature. Then switch back to the use of the maximum charge which yielded satisfactory iron on the preceding day.

Tests Will Show Any Discoloration Caused by Manganese

Do you think a suitable mix for bronze memorial tablets could be made from old steam turbine blades made of 95.21 per cent copper, 4.74 per cent manganese, no tin, lead or zinc, by adding about 5 per cent tin and a like amount of zinc. What effect do you think the manganese would have on the coloring of the tablet?

Presence of manganese in the copper scrap available should not give material trouble in making a red brass, if it is used intelligently. A percentage of 4¾ of manganese in the copper would probably make the material more brittle when made into a red brass for grave markers than if the manganese were not present. It would seem advisable to use this copper manganese alloy in conjunction with some pure copper scrap, so as to reduce the total manganese content in your final alloy.

As far as the effect of the manganese on the coloring of the casting, it is entirely possible that the castings would be more discolored than with no manganese. We have known the presence of manganese to give a blackish color to the castings where the controlled temperature and melting conditions were not regulated carefully. A pickle, however, does remove the blackish color but it frequently is inadvisable to use a pickle and we believe this is true of grave markets.

Therefore, we suggest that one or two trial

heats be made with this copper manganese scrap to determine how much of the scrap can be used in a heat and how much discoloring results from the manganese, as it is reasonably certain that some coloring will be evident unless the manganese content is reduced below that given in your question.

Manganese is a good deoxidizing agent and it also has an affinity for sulphur and, therefore, its presence in reasonable quantities is frequently valuable in the production of sound, clean castings; but such a large percentage as 5 per cent instead of a fraction of 1 per cent offers possibilities of troubles.

Several Factors May Cause Difficulties in Annealing Castings

We are making some castings ranging from $\frac{1}{8}$ to $\frac{1}{4}$-inch thick, cast in permanent molds. They are annealed in a gas-fired, pusher-type furnace at 1700 degrees Fahr. with a complete time cycle of 2 hours and 48 minutes, and a brinell hardness value from 159 to 176 is obtained. However, some of the castings are difficult to anneal due to an excessive chill, requiring that the castings be run through the furnace two or three times. Composition of the castings is as follows: Silicon, 2.35 per cent; manganese, 0.50 per cent; phosphorus, 0.50 per cent; sulphur, 0.140 per cent, and total carbon, 3.40 per cent. Additional silicon above 2.35 per cent is not practicable due to reduction of physical properties which are important.

One of the first suggestions is to conduct a careful analysis of your metal to see whether or not it contains chromium as that element forms hard carbides that are extremely difficult to break down. If that is the case, a longer heat treatment cycle will be required, and its duration determined by experiment. It is possible that addition of nickel may eliminate your trouble, and the quantity required will, like the heat treatment cycle, have to be determined by experiment.

While you state that increase of the silicon above 2.35 per cent will have a deleterious effect upon the physical properties which are important in the castings, we believe that you will find that increase of the silicon to 2.60 per cent will decrease your trouble considerably, without any marked decrease in physical properties. If the latter does occur, try lowering your annealing temperature to 1600 degrees.

Another thought to be considered is the actual time during which the castings are subjected to the highest range of temperature. That time should be sufficient for all parts of the casting to arrive at the maximum point. With your castings the time should range from 15 to 25 minutes, assuming that the preheating zone is sufficiently long to permit the castings to reach or almost reach the maximum temperature. Another point that might be looked into is the cooling period as it is possible that the latter may be too rapid, and nullify the effects of heating. As you know, slow cooling is essential to prevent the carbon from returning to the carbide form.

Other Alloys Are Needed To Meet Brinell Specifications

We have an inquiry on a metal mixture of 89 per cent copper, 10 per cent tin, 1 per cent lead and the brinell is to be 92. The latter is important because it has given best results and the company insists on it. We must submit a sample before receiving an order. What should be added to this mix for necessary brinell?

Your request for a method to insure reliable high brinell for the alloy 89 per cent copper, 10 per cent tin and 1 per cent lead, does not indicate the size or shape of castings you have in mind. A thin casting will give one brinell reading as compared with a similar reading on a casting of thicker section; such a reading would be somewhat higher. This is due to the chill effect of the surface.

However, let us point out to you that a brinell of 92 minimum for that alloy is very difficult to secure and it is not generally recognized as commercially practical. To add something to the alloy that would increase the brinell hardness would, of course, change the alloy and the castings made from that alloy would not be according to specifications.

Again, if these castings are to be subject to machining and a substantial amount of material is to be removed in machining, the brinell reading again will be low. Of course, by increasing the tin content, the brinell hardness may be

materially improved, but this would not be conforming to the specification. We know of no way to insure the regular commercial production of this alloy with a brinell of 92 minimum. It would be more like 65 to 75. Chill casting might tend to raise the brinell by 5 points.

Quantity of Air Needed for Small Cupola

We are contemplating a small cupola 21 inches inside the lining which will have four 2½ x 7-inch openings in the shell and a continuous tuyere on the inside 2½ inches high. What is the hourly melting capacity of a 21-inch cupola? What volume of air is required?

Under normal conditions the rule for calculating the melting capacity of a cupola is to multiply the cross sectional area in inches by 10. However, as the diameter of the cupola decreases, this ratio also must be reduced. Thus while a 42-inch diameter cupola with a cross sectional area of approximately 1400 square inches will melt up to its quota of 7 tons per hour, a 21-inch cupola with an approximate cross sectional area of 350 inches will do well to melt 3000 pounds per hour. That is between 8 and 9 pounds per inch of area. This will require 45,000 cubic feet of air, or 750 feet per minute.

Heat Treating Aluminum Bronze Castings

Can you give us information on annealing or normalizing cast aluminum bronze. Also, what is necessary to increase the brinell hardness of sand cast aluminum bronze? The composition would be 89 per cent copper, 10 per cent aluminum and 1 per cent iron.

Heat treatment of aluminum bronze is a delicate operation and is influenced greatly by the accuracy of the ratio of aluminum to copper in the casting being heat treated.

You will find in the book published by the late Charles Vickers—*Metals and Their Alloys*, on page 266, a description of the heat treament of aluminum bronze. Quoting from this, the process is essentially, that of heating the casting to just below its melting point about 900 degrees Cent. (1652 degrees Fahr.) allowing plenty of time for the heat to soak into the casting and then quenching in cold water. This produces a hard, brittle alloy, which must be annealed to develop the proper characteristics for service.

The book gives as the annealing temperature 650 degrees Cent. (1202 degrees Fahr.), but this annealing temperature may be varied to produce a variation in the brinell hardness. The proper annealing temperature for any given brinell hardness must be determined for any given alloy and any slight variation in the aluminum present, influences the temperature at which the annealing should be done.

You will see from this that the process of heat treating is one that requires most careful laboratory control and precise methods, to say nothing of a large amount of experience. It is, therefore, impossible to give the exact annealing temperatures without precise knowledge of the alloy in question.

Asbestos Mixed With Plaster of Paris

Can you tell us anything on the practice of making patterns from a mixture of plaster of paris and asbestos? What are the proportions of the material and at what temperature are the patterns baked?

Asbestos to the extent of between 10 and 15 per cent is added to the plaster designed for molds and after air drying, the molds are raised to a temperature of approximately 500 degrees Fahr., to drive off the water of crystallization. The asbestos merely serves as a reinforcing agent to prevent disintegration of the mold.

Where the plaster mixture is employed in the formation of a pattern, this extra drying is not necessary. Plaster patterns with or without reinforcement will dry to a satisfactory degree of hardness in the air. In the finished state the pattern absorbs a certain amount of moisture from the air therefore it is advisable to paint it with shellac as in ordinary wood pattern practice. Instead of using asbestos, large patterns usually are reinforced with nails, small rods or with sections of wire netting.

Chiller Section Affects Depth of Chill

We are making a web center, double flange, chilled wheel 2¼-inch face, 17 inches diameter, total weight 175 pounds. What is the proper size chill for this wheel and how long should the chill remain in place after the casting is poured?

The depth of chill on the tread of a wheel is regulated partly by the thickness of the chiller or chill ring, and partly by the composition of the iron. Consequently it is impossible to state an arbitrary thickness without a knowledge of these features in your case. However, assuming that your iron is suitable and that a chill of ⅜ to ½-inch is required, a chill ring with a thickness of 3½ inches will meet your requirements. Where the chills are used repeatedly, four or even six sections will serve more satisfactorily than two complete half sections.

Alternate heating and cooling of the chill sections causes them to *spread* and naturally the degree of spread is more pronounced in a long than in a short section. The chilling effect is imparted to the casting at the moment of solidification, therefore the length of time the chiller remains in position after the casting solidifies is not a factor of any consequence.

However, to prevent distortion or cracking of the wheel, it must be removed from the mold almost immediately after it has solidified and placed in a pit or other suitably heated chamber where it is kept at a red heat for several hours and then slowly allowed to cool over a period of approximately 12 hours.

Probably it is unnecessary to point out that the chills must be clean and dry. Usually they are coated with a thin film of oil containing a small amount of either graphite or red lead. Some foundrymen favor a thin coating of shellac. Great care also must be exercised in seeing that the molds are perfectly level. Chill cracks and other defects usually may be traced to molds even slightly off the level.

Considers Water Suitable for Use in Sand

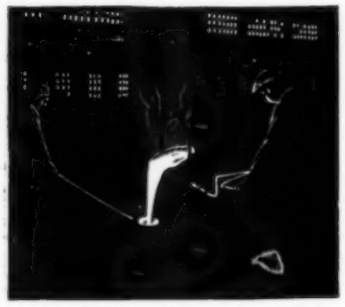
Please advise us whether the following analysis of water would affect the molding sand: Calcium, 4.13 grains per gallon; magnesium, 2.48 grains per gallon; sodium, 1.52 grains per gallon; bicarbonate, 7.9 grains per gallon; chloride, 2.36 grains per gallon; and sulphate, 6.6 grains per gallon. The total hardness as calmium carbonate is 20.6 grains per gallon and the sodium chloride content is 3.9 grains per gallon.

The analysis of your water supply indicates that it is what is termed *hard* water. Undoubtedly, for steam purposes the water would have to be softened to prevent formation of scale in the boilers.

As far as foundry use is concerned, we cannot see any reason why it shuold not be suitable. Viewed from the possibility of lowering the fusing point of the sand, assuming that all of the carbonate and chloride from the water would remain in the sand with no new sand additions, etc., basing it on 1000 pounds of sand, and addition of 20 pounds of water (2.4 gallons) or an amount to increase the moisture content from 4 to 6 per cent, the carbonate increase in 25 working days would be about 0.02 per cent, and the chloride increase about 0.003 per cent.

Possibly you may be thinking about the possibility of the sodium chloride or salt content of the water causing rusting, but when you consider that the value given of 3.9 grains per gallon is only 0.0067 per cent of the weight per gallon, you can see that its effect would be practically nil. It may be well to point out that almost all water contains sodium chloride.

Viewing Foundry Developments



At Short Range

AN ALUMINUM casting alloy developed in England which is said to be particularly applicable for fast moving levers, treadles and brackets for the textile and electrical industries contains 2.5 per cent copper, 1.5 per cent nickel 0.8 per cent magnesium, 1.2 per cent iron, 1.2 per cent silicon and the remainder aluminum. As cast the alloy has a tensile strength of about 27,000 pounds per square inch, 1½ per cent elongation, and a brinell hardness of 80. Solution heat treated, the strength increases to 38,000 pounds per square inch, elongation to 3½ per cent, and brinell hardness to 110. With a solution heat treatment and aging, the strength is 47,000 pounds per square inch, elongation 1 per cent, and brinell hardness 129.

♦ ♦ ♦

Plain copper alloy cast irons are used direct for motor cylinder manufacture, and a 2 per cent copper cast iron has been recommended frequently for use under mild corrosion conditions.

♦ ♦ ♦

METAL charge for the cast crankshaft recently developed by an automobile manufacturer is made up of approximately 50 per cent steel scrap and 50 per cent return scrap, that is scrap from the gates and risers. Suitable amounts of various alloys are added to produce a metal of the following analysis: Carbon 1.25 to 1.40 per cent; manganese 0.50 to 0.60 per cent; silicon 1.90 to 2.10 per cent; chromium 0.35 to 0.40 per cent; copper 2.50 to 2.75 per cent; phosphorus 0.10 per cent maximum; sulphur 0.06 per cent maximum. The metal is melted in a cupola and then treated in an air furnace before it is poured into the molds.

♦ ♦ ♦

Several truck engine manufacturers and a few passenger car makers have standardized on molybdenum cast iron with nickel or nickel and chromium contents for cylinder blocks and heads. The range of analysis for these castings is as follows: Total carbon, 2.90-3.40; silicon, 1.80-2.30; chromium, 0.15-0.40; nickel, 0.15-1.50; and molybdenum, 0.35-1.50 per cent. The alloyed blocks and heads are said to be superior in strength, hardness, machinability, wear and resistance to shock and heat changes.

♦ ♦ ♦

CAST aluminum may be arc welded with a rod containing 95 per cent aluminum and 5 per cent silicon. Silicon lowers the congealing point of the molten metal permitting the parent metal to dissipate more residual heat and to contract through a considerable section before the weld metal cools below the plastic stage. Silicon also increases the hardness and tensile strength of the weld metal and also gives a finer grain structure. Machine coated rods are recommended.

♦ ♦ ♦

While cerium has been suggested as a deoxidizing agent for gray iron, it is said that actually it has little or no effect as a cleanser. However, additions of 0.15 per cent cause an increase of 18 per cent in transverse strength, and give a better deflection value. Also the molten metal appears to be much more fluid.

♦ ♦ ♦

It is said that a copper-silicon alloy containing 3 to 4 per cent silicon with or without 2 per cent iron is being used in England for many cast parts.

♦ ♦ ♦

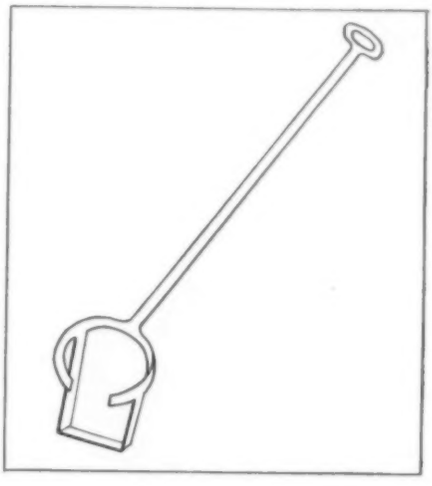
Nickel content up to 3 per cent in cast iron for glass molds imparts a greater ability to take on a higher polish, increases the density and hardness and reduces elongation with little sacrifice in machining properties. Heat resistance to the scaling is improved greatly by the addition of 0.5 to 1.0 per cent molybdenum and 0.75 to 1.5 per cent cerium.

♦ ♦ ♦

To prevent the cores from scraping the delicate skin dried surface of a V-8 cylinder block mold in one foundry, thin strips of steel about 2 inches in width first are placed on the mold surface. After the cores have been slid into place the strips are withdrawn.

♦ ♦ ♦

MANGANESE steel impellors are made in one small foundry equipped with a ½-ton acid lined electric furnace. The carbon steel heat is melted in the furnace in the usual manner, while the manganese addition is melted in a crucible in an adjoining oil fired furnace. When both heats are ready for tapping the crucible is lifted with a tongs and placed in the hand shank shown in the accompanying illustration. The crucible has straight sides, therefore it cannot be gripped by the shank. The ring keeps it upright, while the bar across the bottom supports the weight. The ring is well above the center and consequently the crucible may be manipulated with perfect safety while pouring the molten manganese into the ladle while the latter is receiving the molten steel under the spout of the furnace.



♦ ♦ ♦

Brick machine wear plates of alloy cast iron containing 2 per cent nickel and 0.75 per cent chromium, have delivered 150,000 bricks and still are in service.

Men of Industry

Whose Activities Are Making Foundry History

WILLIAM NEWLANDS, formerly superintendent No. 2 foundry of the American Engineering Co., Philadelphia and previous to that with the Walker Foundry & Machine Co., Roanoke, Va., recently has been made foundry superintendent of the Philadelphia & Reading Coal & Iron Co., Pottsville, Pa.

JOSEPH L. GOODMAN recently was re-elected president of the M. L. Oberdorfer Brass Co., Syracuse, N. Y. Other officers include the following: R. E. P. DIGNEY, vice president and JAMES M. SCOTT, secretary and treasurer.

ARTHUR W. WRIEDEN, formerly with the Holland Furnace Co., Holland, Mich., has been made president of the Warm Air Furnace Manufacturers institute and manager of the code authority of that industry.

ARTHUR J. RAMSAY has been elected vice president of the Pittsburgh Rolls Corp., Pittsburgh, subsidiary of the Blaw-Knox Co. He has been with that company for over 22 years, recently being sales manager.

W. E. CLOW, president, James B. Clow & Son, Chicago, recently awarded a bronze plaque to the National Cast Iron Pipe Co., Birmingham, Ala., for the company's safety record. Only one lost-time accident was recorded during the past year.

GEORGE K. VIALL has been elected a director of the Chain Belt Co., Milwaukee, to succeed the late Clifford F. Messinger. He has been associated with the company since 1921, first as assistant to the president, then works manager and more recently a vice president.

JACOB BETTMANN, Cincinnati, one time secretary of the Favorite Stove & Range Co., Piqua, O., was elected chairman of the board of directors of that company recently. Other officers were re-elected including WILLIAM C. KATKER as president, L. M. FRIGGE, secretary-treasurer, and JOHN H. FECKER, superintendent.

CLARENCE A. YOUNG, for years active in steel castings sales in the Pittsburgh district, now is associated with the sales department of the Ma-

Clarence A. Young

chined Steel Casting Co., Alliance, O. With headquarters in Alliance, he will have charge of the Pittsburgh and Youngstown, O., districts in the sales of rolling mill equipment and other heavy steel castings. Previously he has been connected with the Lewis Foundry & Machine Co. and the Duquesne Steel Foundry Co., Pittsburgh.

R. E. RISLEY, formerly head of the standard department, Goslin-Birmingham Co., Birmingham, Ala., has become connected with Jones Associated Engineers, Inc., Conway building, Chicago. Mr. Risley was graduated from the university of Illinois, Urbana, Ill., in 1920, and for the following 10 years was connected with the Stockham Pipe & Fittings Co., Birmingham, as research engineer, chief engineer, assistant foundry superintendent and superintendent of the inspection department, respectively. He then became connected with Goslin-Birmingham Co.

DR. O. N. GREEN recently was re-elected president of the Newton Foundry Co., Newton, Iowa. GEORGE NELSON was made vice president, succeeding M. S. VINCENT, and F. J. KELLEY was re-elected secretary-treasurer. Directors include ROBERT C. HAMMER, L. L. BRIERLY, D. D. JONES, GEORGE NELSON, M. S. VINCENT, WILLIAM JENSEN, F. J. KELLEY and DR. O. N. GREEN.

JAN R. DUNSFORD has been named chairman of the board of Union Steel Casting Co., Pittsburgh, subsidiary of Blaw-Knox Co. FRANK CORDES is president, D. V. SHERLOCK manager, WILLIAM P. MCGERVEY JR. assistant to the president, ROBERT H. CUNNINGHAM sales manager, WALTER H. EISENBEIS assistant sales manager, JOHN N. CRITCHLOW and GRANT W. LILLIE sales representatives.

FRANKLIN FARREL JR. was re-elected chairman of the board of directors and NELSON W. PICKERING was named president of the Farrel-Birmingham Co. Inc., Ansonia, Conn., recently. Other officers include the following: DAVID R. BOWEN, vice president; CARL HITCHCOCK, FRANKLIN R. HOADLEY, and ARMIN G. KESSLER, vice presidents; FREDERICK M. DREW JR., treasurer LAURIE K. BLACKMAN, assistant treasurer; GEORGE C. BRYANT, secretary; and WILLIAM B. MARVIN, assistant secretary.

Obtaining NRA Insignia

Individuals and firms still operating under the President's re-employment agreement or blanket code as extended until April 30, 1934, may secure additional insignia of NRA through their post office by furnishing the postmaster with a simple receipt in accordance with information posted in the local post office. The National Recovery administration has announced that reasonable quantities will be supplied while they last.

Michigan State To Hold Short Course

Michigan State College of Agriculture and Applied Science, East Lansing, Mich., will hold its second foundry short course April 19 to 21. A number of interesting papers have been arranged, devoted in the main to the melting practices for cast iron.

The tentative program for the meeting is as follows:

Thursday, April 19

11:00 a. m. Chairman, Frederick G. Sefing, Michigan State College.
"The Development of Melting Cast Iron"

2:00 p. m. Chairman, Jesse D. Stoddard, Detroit Testing Laboratory, Detroit.
"Refractories"
"Slags"
"Cupola Design"

7:00 p. m. Dinner at M.S.C. Union Monthly meeting of Detroit Foundrymen's association.

Friday, April 20

9:00 a. m. Chairman, P. W. Blackwood, Buick Motor Co., Flint, Mich.
"The Air and Gases in the Cupola"

2:00 p. m. Chairman, H. Rayner, Dodge Bros. Inc., Detroit.
"Cupola Operation"

7:30 p. m. Chairman, Glenn Coley, Detroit Edison Co., Detroit.
"Electric Furnace & Duplexing"
"Special Cast Iron Alloys"

Saturday, April 21

9:00 a. m. Chairman, Fred Walls, Eaton-Erb Foundry Co., Detroit.
"Cupola Control"
"What the Future Holds for the Cast Iron Industry."

Arrangements for the short course are being made by Frederick G. Sefing, metallurgist, division of engineering, Michigan State college at Lansing.

Detroit Founders Study Sand Preparation

Harry W. Dietert, Harry W. Dietert Co., Detroit, addressed the Detroit Foundrymen's association at a meeting held in the Savoyard club, Feb. 15 on "Preparing Sand for Molding." Mr. Dietert discussed the importance of good foundry sand, the shape of sand grains, the effect of moisture on permeability, strength and mold hardness, the content of clay bond, the effect of fineness on permeability, strength and hardness, and the variations in dry strength and green strength.

A number of visitors were present, including L. M. Marienbach, State institute of Planning and Designing Automotive Parts, and A. I. Stoliar, Kharkov tractor plant, Russia; A. E Hageboeck, Frank Foundries Corp., Moline, Ill.; George Cannon, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.; Prof. H. L. Campbell, University of Michigan, Ann Arbor, Mich.; and C. J. Lonnee and Joseph L. Brooks, Sparta Foundry Co., Sparta, Mich.

Organize To Comply With Equipment Code

Organization of the foundry equipment industry to comply with the code of fair competition of the industry was completed at a three-day meeting of foundry equipment manufacturers at Cleveland, Feb. 10-12. Code of that industry was approved on Feb. 6 and became effective Feb. 17.

The members of the code committee designated by the board of directors of the Foundry Equipment Manufacturers' association was the board of that organization in its entirety and includes the following: Thomas W. Pangborn, Pangborn Corp., Hagerstown, Md.; E. O. Beardsley, Beardsley & Piper Co., Chicago; F. R. Wallace, Tabor Mfg. Co., Philadelphia; R. S. Hammond, Whiting Corp., Chicago; V. E. Minich, American Foundry Equipment Co., Mishawaka, Ind.; Edward A. Pridmore, International Molding Machine Co., Chicago; Don A. Weber, Deister Concentrator Co., Fort Wayne, Ind.; H. S. Simpson, National Engineering Co., Chicago, and S. C. Vessy, W. W. Sly Mfg. Co., Cleveland. These men with one who may be elected by non-members of the association will compose the complete code authority. S. C. Vessy was chosen chairman; E. O. Beardsley, vice chairman, and John D. Wise, secretary and treasurer.

Mr. Wise, who also was elected secretary of the Foundry Equipment Manufacturers' association, will be in charge of management of the affairs of the group and the industry under the code has established an office at 1213 West Third street, Cleveland.

The National Recovery administration recently announced the appointment of Oscar Grothe, White Sewing Machine Co., Cleveland, as the administration member of the Code Authority for the foundry equipment industry. Joseph Dilworth, assistant deputy administrator, is in charge of the code.

Institute of Metals, London, has arranged an educational tour to Belgium from April 8 to 14. Student members of the organization will have an opportunity of visiting six large metallurgical establishments and of seeing something of Brussels, including its university, and Bruges.

Plan Conference at Ohio State University

A foundry conference and district meeting under the auspices of Ohio State university in co-operation with the American Foundrymen's association will be held at Ohio State university, Columbus, O., April 5 and 6. In addition to a technical program, the conference will include an educational exhibit of foundry products and equipment. All departments of the engineering college will be open for inspection and it is planned to provide a demonstration of special interest to foundrymen. The Battelle Memorial institute, Columbus, also will be open for inspection.

The program for the meeting is as follows:

Thursday, April 5

10:00 a. m.—Short Talks by George W. Rightmire, president, Ohio State university; E. A. Hitchcock, dean, college of engineering; John Younger, chairman, department of industrial engineering; R. E. Kennedy, technical secretary, American Foundrymen's association.

1:00 p. m.
"Economic Aspects of Fuels Used in the Foundry," by D. J. Demorest, chairman, department of metallurgy.
"The Heat Treatment of Steel Castings," by C. Smith, Bonney-Floyd Co.

Friday, April 6

9:30 a. m.
"Insulating Refractories," by G. A. Bole, Engineering Experiment station.
"Some Important Factors in the Preparation of Molding Sand." (Speakers to be announced.)

1:00 p. m.
"Function of Slags in the Melting of Ferrous Metals," by W. J. McCaughey, chairman, department of mineralogy.
"Recent Developments in Malleable Cast Iron," by C. H. Lorig, Battelle Memorial institute.

6:30 p. m.—Dinner at Pomerene hall, Ohio State university.

The district meeting is in charge of a general committee of the following members of the American Foundrymen's association: A. W. Gregg, Bonney-Floyd Co., chairman; A. H. Dierker, Ohio State university, secretary; E. W. Campion, Buckeye Steel Castings Co.; J. M. Kittle, Ohio Malleable Co.; L. H. Marshall, L. H. Marshall Co.; H. W. DeBruin, Jeffrey Mfg. Co.; William C. McMahon, Columbus Malleable Co.; Dr. Lorig, Battelle Memorial institute, and R. P. Schneider, Ohio State university.

Is Made an Officer

C. O. Anderson, formerly with the Leeds & Northrup Co., Philadelphia, and more recently with the Claud S. Gordon Co., Chicago, has been elected vice president and appointed general manager of the Pyrometer Service & Supply Corp., 1988 East Sixty-sixth street, Cleveland, a subsidiary of the Claud S. Gordon Co.

Prevent Losses with

Proper Gates and Risers

BY PAT DWYER

IN ORDINARY practice it is impossible to work out the exact proportions of heads for steel castings in advance, or to draw hard and fast positive conclusions from the position and shape of the pipes in the castings and heads. In the majority of instances a careful investigation will show that piping can be corrected at the expense of a minimum amount of metal scrapped, or that the size of the heads can be reduced. However, this result can be secured only if the foundryman bends his reasoning abilities to a consideration of the proper design of heads and necks and then makes sure that the metal is placed where it will do the most good.

The important fact always should be kept in mind that as metal in a head flows or tends to flow by gravity, the action of the head is the most efficient downward. Extent to which a head will feed a casting section extending principally in a horizontal direction evidently is not great. Hence where heads are to be provided on a casting with a considerable extent of horizontal surface, especially if the vertical dimensions of the casting are small, a number of heads must be provided and they must be placed so close together that their effects will overlap. The casting will be fed more efficiently by a number of comparatively small heads placed close together than by one, or by a few heavy heads spaced far apart.

Height Governs Pressure

Occasionally a foundryman will place a few very thick, but comparatively short heads on one of these castings. The practice is based on the belief that great total weight of metal in the heads will cause the casting to be fed throughout. The height of the heads is the only factor governing the pressure required to force the metal to flow laterally to the distant parts of the casting. The total weight of the heads *per se* has nothing to do with their effectiveness in feeding far in a horizontal direction.

Therefore it is apparent that short, thick heads will feeed only a limited area near their bases, frequently an area that cannot use all the metal they can supply. Hence a considerable part of this extra weight represents wasted metal. Were this extra metal distributed over the casting in a number of small heads, nearly all of it would be utilized in feeding the shrinkage immediately below each head and consequently the casting would be fed satisfactorily.

Where only a few heads can be placed upon this type of casting, so that each head must feed horizontally to a considerable distance, cognizance should be taken of the fact that the amount of metal to be fed may not be great, but considerable pressure is required to force the metal to flow laterally through an irregular opening. High heads are needed to produce this pressure. Increased height of heads to feed these castings, in some cases should be accompanied by decreased diameter, to reduce so far as possible too great a waste of metal.

Heavy heads with thick necks attached to the sides of castings near the bottom represent another and fairly common type of error. The heads are made very heavy, an error based on the idea that their total weight will serve as a factor in forcing the metal at the bottom up into the casting to compensate for the shrinkage. If the first heads fail to feed as expected, heavier, but seldom higher heads are tried.

Referring back to the remarks on the laws of fluid pressure, it readily is apparent that the effective pressure exerted by the metal in the heads upon the neck of the casting shown in Fig. 225 is proportional only to the difference in level $A - B$, between the metal in the head and that in the casting. After pouring is stopped only the portion $A - B$ of the head is effective in producing any pressure that will cause the metal in the neck to flow in toward the casting. Increased diameter of the head will not increase this pressure in the slightest degree. The only advantage of a large head is that it will keep the metal hot longer and thus prolong the period during which pressure is exerted. Increased height of head increases the pressure in proportion to the height.

Side Heads Ineffective

The principal disadvantage of attached heads at the side near the bottom of a casting is they do not discharge fluid metal directly downward into the top of the gradually deepening pipe. In effect they simply bring pressure to bear on the still liquid metal in the casting and to a certain extent force that metal to flow upward and close the pipe after the manner in which a solidifying ingot is compressed at the bottom in a pressure device installed for that purpose in some plants.

Manifestly any pressure exerted in this manner must lose its effectiveness as soon as the metal in the casting becomes too sticky to flow. Also, however long the heads may remain

(*Continued on Page 37*)

Need High Heads

SINCE liquid metal flows downward by gravity it is apparent that heads will feed most efficiently when placed directly on top of the casting. The effect of even large risers placed at the side of the casting is nullified by the fact that the rising metal in the casting balances the metal in the riser and hence cancels the pressure. Also the rapidly congealing metal in the casting prevents or retards any flow of metal from the riser. The importance of high risers coupled of course with adequate volume in the body of the riser is recognized particularly by the manufacturers of valves and other types of castings designed for high pressure service. A close examination of nearly any feeding head will show that a spongy or otherwise unsatisfactory condition exists below any actual cavity or pipe.

ADVERTISING PAGES OMITTED

(*Continued from Page* 34)

fluid they cannot feed the portion of the pipe which forms after the outside metal in the casting has become solid.

A head placed on top of the casting continues to feed the pipe so long as the metal in the head and neck remains fluid and it feeds chiefly by direct flow in response to the law of gravity, not by attempting to force the metal in the casting to move upward against the same law of gravity. Hence a top head feeds efficiently at all stages of the pipe formation. Heads placed in the manner shown in Fig. 225 inevitably must be seriously inefficient. In the great majority of instances they may as well be omitted altogether.

Molds for thin castings, especially long, narrow, shallow sections frequently are elevated at the gate or pouring end. The first and obviously the most important reason for doing this is that the pouring of the metal is facilitated where all the metal runs down an incline, instead of flowing over a level surface. In some instances a casting may be run in this manner that is a failure when poured in a horizontal position.

Castings Poured on End

A second advantage of this method is that to some extent it substitutes top pouring and downward feeding by the heads along the length of the casting, for bottom pouring. The more the gate end of the mold is elevated, the greater this advantage. The ideal method, and one adopted wherever possible is to pour the casting on end, that is in an upright position so that when the mold is filled each section of the casting may feed the section immediately below it. A comparatively light head on top of an upright mold will suffice to insure a sound casting, where a similar mold poured "on the flat" might need several heads distributed along the casting.

Under certain conditions a casting poured on an incline can be made sound by the action of chills placed on or around the lower end and without the use of sinkheads. The metal running in through the gate at the top or high end does most of the feeding while the casting is being poured. The metal in the sprue suffices to feed the final shrinkage that takes place after pouring ceases.

Heads are necessary where the effect of the chills is not sufficient to make a casting sound. These heads frequently are placed near the lower end of the casting, especially if that end is the heavier. In this position the heads will not feed as efficiently as they should. This feature is illustrated in Fig. 226.

If the runner will suffice to feed the casting as far along as *E*, then the remainder of the metal in the casting from *E* to *D* will tend to run downward toward *D* and will exert a fluid pressure proportional to the height *E-G*, the difference in level between the casting at points *E* and *D*. The portion of the head *F-D*, equal to *E - G* is useful only to balance this pressure. Only the portion of the head *F-C* exerts any pressure on the metal in the casting.

The foregoing conditions are almost exactly similar to those in the case of the side attached heads referred to previously. An attempt is made to have the head close a pipe which will form in the upper portion of the casting between *D* and *E*, by forcing the metal in the lower part of the casting to flow against gravity and close a distant opening. A second head between *D* and *E* might or might not be located fortunately just over the place where the pipe will develop. The position of this pipe will vary from casting to casting, depending upon the temperature of the metal, speed of pouring and other related features.

If for any reason the head on this casting must be placed at the lower end, the head should be made as high as possible within reason and should be filled with hot metal direct from a second ladle. If the head is filled with metal which first entered through the gate, this metal rising in the head will be cold when pouring ceases, particularly if chills are used on the heavy portion to counteract to some extent the tendency of the metal to freeze first at the top.

In this and in fact wherever possible the heads should be filled with hot metal. If the plan is feasible with nothing to prevent, the mold should be tipped up and gated at the heavy end in conformity to the rule that the top of the casting should be the last portion to freeze. For the same reason the head should be on the upper end. Chills, if used at all should be located on the lower end, but if the lower end is much lighter than the upper end, chills may not be needed.

Need High Heads

Among the many features involved in the manufacture of steel castings, according to a recent article in THE FOUNDRY by David Evans, none exert greater influence on the soundness and strength of castings than the size and location of the gates and risers. The subject deserves most careful study if high grade work is to be turned out.

At a recent meeting of steel foundrymen, a discussion on this point disclosed a surprising lack of knowledge on the part of supposedly experienced foundrymen. They defended a commonly held theory that a riser is adequate if no cavities appear closer than ½ inch above the casting. A close examination of a sectioned riser will indicate the fallacy of this theory. In really high class castings the risers are so high and so large that all visible cavities appear in the upper two-thirds of the risers.

To show the unsound metal in a typical riser from a 4-inch valve casting the metal was sawed through down to the point where it joined the casting. The cut face was etched to reveal minute cavities and marked porosity extending through approximately three quarters of the height of the riser. The margin of safety was reduced to one-fourth of the height. Even this last quarter cannot be considered sound metal. An area of softened, weak steel followed the tip of the spongy metal revealed by the etch.

A graphic presentation of the feeding action is shown in Fig. 227, a sectional imaginary view of a typical adequate riser. The large cavities in the first or upper section of the riser

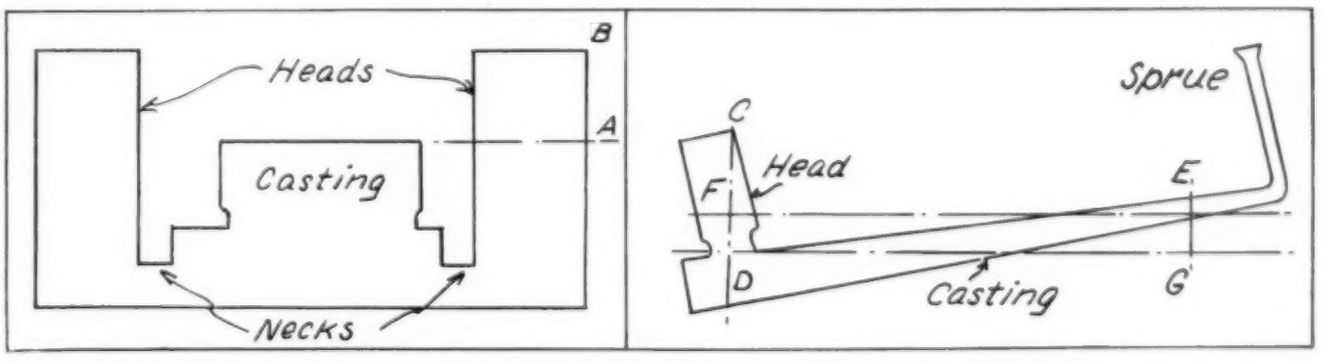


Fig. 225 (Left)—Feeding risers at the side of the casting are not effective since the necessary pressure is exerted only from the area AB. Fig. 226 (Right)—Diagram showing areas fed by runner and riser

were caused by the subsidence of the liquid metal from between the riser walls. As the metal cooled further, it became pasty and the feeding action though retarded, still continued. The metal was pulled in. Minute cavities and spongy structure resulted. The defects arranged themselves in the shape of successive arrow heads, pointing downward toward the casting. This formation is quite distinct and apparent on the face of the riser shown in the illustration.

The final stage of the feeding action takes place when the metal has hardened further, but has not yet acquired strength. It weakens and softens the metal beyond the last faults visible by etching. An ample margin is necessary to insure that solid steel will be formed above the neck of the riser.

Risers Cause Rejections

The practice of some foundry foremen to "Cheat on the size of the risers" throws a heavy burden on the cleaning room in the attempt to salvage castings containing large shrink holes under the risers. Also it inevitably results in a heavier percentage of rejected castings after the customer has spent considerable time and money in machining them. It is done, of course, in an attempt to show a high yield of castings in proportion to the amount of metal melted. A high yield one month usually means a heavier percentage of returned castings on the following month.

The opposite extreme is based on the broad assumption that a heavy riser is a cureall and a guarantee against defective castings. This practice also places an extra burden on the cleaning room besides cutting down the percentage of yield in good castings. Many castings are made without risers of any kind. Present reference applies particularly to valves and fittings. It is fairly safe to state that no pressure casting was produced satisfactorily without intelligent knowledge and application of the size and location of risers.

In accordance with the principle of shrinkage following the law of gravity referred to previously, many foundries have adopted the practice of casting disks, wheels and other castings in a vertical instead of the usual horizontal position. The molds are made in the usual manner from existing or special pattern equipment in a horizontal position, but are assembled and placed in a vertical position before they are filled with steel. In a typical example, the method shown in Fig. 228 was adopted to insure solid metal in steel gear blanks that almost invariably showed holes around the rim where the molds were cast flat in the usual manner. Apparently these wheels were solid leaving the cleaning room, but the cavities showed up when the teeth were cut in the rim afterward.

A half pattern was located in the bottom of a square corebox and a number of half cores were made which corresponded to the usual copes and drags. Suitable dowels were placed in the bottom of the corebox to form corresponding pro-

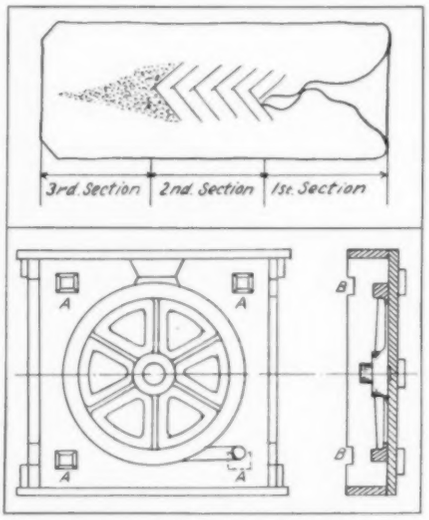


Fig. 227 (Above)—Shrinkage defects appear from top almost to bottom of feeder, Fig. 228 (Below)—Plan and sectional views of equipment for casting wheel on edge

jections and depressions for matching the half cores after they were dried. One dowel was changed alternately from right to left to accommodate the gate and runner. Two channels were formed across the back of each half core to hold a pair of flat clamping straps. After the cores were dried they were assembled in groups of four or six arranged to be poured from a single sprue. Long bolts extending through suitable holes near the ends of the straps were used to bind the cores closely together.

Where the same method is used for molding flat disks the entire pattern is placed in the core box. The back of each core forms the cope face for each adjoining drag. In some instances the cores are assembled inside a flask or other form of container and the space between the outside cores and the flask walls is packed full of sand. Other methods for holding the cores in position also are available, depending on the size of the cores and the available equipment. In all cases it is necessary to see that the joint faces of the cores are straight and that they touch each other at all adjoining points to prevent the metal from leaking.

This is the fiftieth of a series of articles dealing with the various types of gates and risers in the foundry industry. The fifty-first installment will appear in an early issue.

THE EDITORS.

Malleable Industry Proposes Cost System

The board of directors (code authority) of the malleable iron industry, represented by R. R. Fauntleroy, Moline Malleable Iron Co., St. Charles, Ill., on March 3 formally submitted a proposed cost accounting system and schedule of fair and reasonable costs, to Assistant Deputy Administrator O. W. Mason, at a public hearing held in Washington.

The proposal, which is in accordance with Article V of the approved code for the industry, prescribes a number of primary divisions on which a specified minimum number of cost accounts shall be kept, and outlines in detail a procedure for determining the cost of individual types of castings.

In establishing the proposed schedule of costs, it is provided that "A member of the industry may quote and sell any castings at a price less than that set forth in the approved cost schedules if such price is based on the actual cost experience of such member, determined in accordance with the approved cost accounting system . . . and providing further that such cost is filed with the secretary of the code authority not less than 5 days prior to the date upon which such cost becomes effective. . . ." However, any member of the industry who identifies the particular casting in question and requests the lowest cost filed, must be informed by the secretary. "Such cost may thereupon be used by such other member as the fair and reasonable cost for such particular casting. . . ."

C. C. Gibbs, National Malleable Iron Casting Co., Cleveland, objected to the establishment of the 5-day period.

The presiding deputy suggested that a revision be made so that all members in the industry would be notified of the lowest cost on file rather than requiring a member to request it. Sponsors claimed this would be impracticable because, they pointed out, only a few members in the industry would be interested in a given casting.

R. N. Cole, Canton Malleable Casting Co., Canton, O., expressed the opinion that members who are located at greater distances from the secretary would be at a distinct disadvantage, if the 5-day waiting period were eliminated.

Other participants at the session included E. E. Griest, Chicago Railway Equipment Co., Chicago; John C. Haswell, Dayton Malleable Iron Co., Dayton, O.; and Robert E. Belt, secretary of the Malleable Founders' society, Cleveland. Advisers present included Messrs. Wilkerson, Burton, Delaney, McNulty, Beatty, Reich and Taggert.

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Makes High Silicon Iron Castings

(*Continued from page* 14)

wide variety of types employed.

Molten high silicon iron oxidizes rather rapidly when exposed to the atmosphere, and considerable care must be observed in location and shape of the gates so that dirty or drossy castings will not result. Since the metal has an increased solidification shrinkage due to the elimination of gas in the metal, risers must be of ample size to feed the castings satisfactorily, and on some castings it is quite a problem to locate the risers to obtain the best results.

In its tendency toward oxidation, and in the effects of that oxidation, high silicon iron has many of the characteristics of aluminum alloys. Apparently the oxidized silicon forms a skin similar to that on molten aluminum and its alloys which, when disturbed, becomes enmeshed in the metal. Consequently, when pouring high silicon iron, the stream of molten metal must enter the casting with as little disturbance as possible, and the sprue must be kept full. Any cessation of the stream entering the casting will disturb the oxidized film, cause it to break and be carried into the stream, and result in either a drossy section or what may be termed a cold-shut or lack of union.

Favor Choked Sprues

Experience of the Duriron Co. has dictated the use of choked sprues rather than choked gates as is the case with gray and malleable cast irons. The choked area of the sprue is about 60 per cent of the area of the opening, that is to say if the opening or entrance to the sprue is 2 inches in diameter, the choked portion is about ½-inch in diameter. The change from the entrance diameter to the choke diameter is not gradual, but abrupt, with of course, a curved section joining the two different diameters to eliminate any corners. The choked portion of a sprue extends down from a point about 2½ inches above the gate; the curved section joining the two diameters occupies about 1½ inches, and the remainder of the sprue is the same diameter as the entrance.

Location of the gate is extremely important as any disturbance of the inflowing stream usually causes drossy places due to the folding-in of the oxide film. Consequently, the gate is placed so that the entering metal has an unobstructed path. For example in making sanitary pipe the gate is placed at one end along side the core in the drag mold.

Plug cock bodies, plugs, and Y-valve bodies usually are made in full dry-sand cores. Those castings have seats that must be perfectly clean as they are ground to close tolerances and are given a high finish. Following the usual foundry procedure, the mold is arranged so that the seats will be at the lowest point possible, and gating is from the bottom. Since the castings are somewhat intricate, cores forming the exterior and interior are assembled on their sides, and then stood on end for pouring vertically.

Ram-up Cores Are Used

Fig. 3 shows the cope and drag molds for a centrifugal pump casing with the cores in place. As may be observed ram-up cores are employed at three points in both cope and drag to form the suction, discharge and neck flanges. The sprue is shown in the upper right hand corner of the cope, and two riser openings are indicated in the lower right hand and upper left hand corners. The gate is cut in the cope while a dry sand core on the drag is located directly under the sprue opening to prevent any possibility of cutting the sand.

Due to the high solidification shrinkage, and comparative fragility of high silicon iron, production of large castings requires the highest type of foundry technique and craftsmanship. In cored work particularly, the core must be made so that it will be strong enough to withstand the inrush of molten metal, but also be such that it will yield readily against the strains set up during the solidification period. As an added precaution, the cores are dug up or broken up shortly after the metal has set.

A mold for one of the largest castings regularly made by the Duriron Co. is shown in Fig. 4. It is a 650-gallon kettle which in the finished state weighs about 6500 pounds. As may be observed, the mold is made in steel flask sections, part of which are placed in a pit in the floor. Both cope and drag are dried carefully by charcoal fires to eliminate any possible difficulties from moisture. The casting is bottom poured through two sprues which also open into the top of the casting just under the flange. Three risers are placed equidistantly around the flange.

Due to its large size, the kettle casting is allowed to remain in the sand for about four days so that any casting strains are equalized through self-annealing. Medium size castings which can be handled without much difficulty are removed from the sand while still hot, but somewhat under the red heat stage, and placed in normalizing furnaces where they are cooled slowly.

Castings are cleaned in two departments. Sanitary pipe and fittings are cleaned in the same building that houses the sanitary warehouse while all other castings are handled in the main cleaning department. The first operation in cleaning is to knock off gates risers and fins, and that is followed by removal of the cores. Then the castings are loaded on cars and sent to the sandblast room. All castings are sandblasted, due to their physical characteristics. After sandblasting the castings are inspected, ground, dipped or pickled in a hot 10 per cent sulphuric acid solution, and sent to the stockroom or shipping department. Castings that are to carry acids, such as cocks, pumps, S-bends, pipe, etc., are pressure tested after pickling.

Cores for the various castings are made in a well lighted department about 60 x 100 feet with side walls almost entirely glass. In general the cores are made from lake sand and linseed base core oil although as shown in Fig. 2 loam cores are made for medium size pipe. Cores for large pipe and tubes are made in oil sand, but they are constructed so that they merely are shells. As mentioned previously, since no chaplets can be used, the cores are rodded heavily to supply the necessary stiffness. For example cores for 4-inch sanitary pipe as shown in Fig. 6 are made in halves and pasted together after drying. Two heavy rods stiffen the core, one in each half. The rods are about ¾-inch in diameter. An idea of the variety of cores made may be gained from Fig. 7. The large hemispherical object in the rear is the bottom or lift core for the main core of a large kettle. The core suspended at the right is for a bleacher tower base. In addition the group includes sanitary fitting cores showing the lock prints used, S-bend condenser tube core, valve or cock body, fan casing, pump impeller core, etc.

New England Association Discusses Patterns

Charles F. Miller, Universal Winding Co., Providence, R. I., spoke at a meeting of the New England Foundrymen's association on Feb. 14 at the Engineers' Club, Boston, on "Hand Vs. Production Patterns." Mr. Miller discussed pattern equipment as furnished by the foundry, with due consideration given to both customer and foundry views. He pointed out that the ultimate need was to encourage customers to supply better pattern equipment. An interesting discussion followed.

A. S. Wright, Hunt-Spiller Mfg. Corp., Boston, presided in the absence of the president. Following the dinner, A. B. Root, Hunt-Spiller Mfg. Corp., addressed the 43 members present on the code situation as it pertained to the foundry industry throughout the country.

ADVERTISING PAGES REMOVED

Foundries Scan NRA Results

(*Concluded from page* 16)

these regulations nor appreciate what they may mean in their own relations with the customer or with their competitors.

A malleable foundryman remarking on the application of fair practice regulations says: "Selling practices in the malleable industry were probably increasingly sloppy under the pressure of desperate necessity for what little tonnage was available. Trade practices forbidden under our code were not what could be regarded as immoral practices, but rather too loose extension of collateral services which finally expanded into requirements and then demands by customers, tending to make sales unprofitable for all foundries."

Another says: "Application of fair practice regulations has been beneficial, but not to the extent of the cost entailed by negotiating and administering the code."

Cannot Change Human Nature

Still another states the condition as follows:

"Trade practice regulations have helped very little. Those who were decent competition still are. They did not need any NRA to make them decent. We cannot see any great improvement in some of the worst offenders, although there is a little betterment among some of them."

A gray iron foundryman summarizes the experience with reference to trade practices by stating that he has found that the larger concerns are more disposed to be fair in competition and in their buying practices than some of the smaller. He states that the question probably resolves itself to the old fundamental question of supply and demand. "If business improves," he says, "cheating and chiseling will evaporate, but if another decline is encountered the law of self-preservation will assert itself again and General Johnson will have to do considerable cracking down to change human nature."

The question of the influence of buyers' attitude upon the whole industrial picture has been prominently before those actively interested in codes and their probable effect on business. In other words, every manufacturer and purveyor has expressed the highest hope that his customers, and particularly their purchasing departments, would learn all about NRA and would prove co-operative to the point of recognizing and being governed by the conditions confronting the vendor manufacturers. Accordingly, a number of foundrymen were questioned as to whether the codes had had any effect upon their relations with their customers and whether there was less tendency to press for lower prices.

The steel foundry industry has had the longest experience in this regard both through the earlier acceptance of its code and also the earlier recognition of increased costs and the resultant necessary higher price level. Considerable resistance has been encountered and has resulted in bringing out inequalities which have been adjusted. A better relationship between districts is reported, although as one aptly put the question, "Some salesmen still require calcium for bone-building between the neck and hips."

A malleable foundryman states that while there is less tendency to demand lower prices he is not sure whether credit should be assigned to the codes or to the general feeling that all prices are due for increase. Among purchasers of quantity requirements of malleable the pressure for lower prices has been reported as increasing instead of decreasing. This has been accompanied by mutual recrimination between foundries as to their policy in meeting the demands from large quantity buyers. The threat expressed or implied, of large requirement firms that they will build their own foundry capacity, while not too seriously regarded, has exercised a measure of demoralizing influence. This, coupled with a reputed distaste for all codes on the part of some buyers, and perhaps not entirely unwarranted in view of consumer expressions in the daily press, has kept alive a considerable chiseling attitude.

Try Out New Tricks

All of the old tricks of unscrupulous buyers and a few new ones have been unearthed and tried upon the codified foundry industry. A gray iron foundryman states that a short time ago a customer inquired for a large number of castings stating that he probably would take them over a period extending to August 1934. A quotation covering the patterns and price on castings good for the first quarter and subject to advance was rejected with the buyer's statement that he did not expect to buy any until April and that he merely wanted to get the order settled at present prices to avoid higher prices due to the application of the gray iron code and possibly a similar effect on pattern prices. It was stated that he placed the order with a competitor of the foundry interviewed.

Another gray iron foundryman says: "Most of the large firms realize that there has been a decided tendency to increase prices having found increases in all of the materials that they buy. Purchasers of this type are willing to co-operate. However, it is the smaller institutions and some of the sharp buyers who resist the tendency and will change their source of supply for ⅛-cent per pound at any time, not realizing what it means to their own production departments and the likelihood of causing themselves embarrassment if business picks up."

Costs Have Increased

Summarizing, the index of opinion in the foundry industry holds that labor and material costs have been increased beyond doubt. Some advance in castings prices have resulted, but not yet sufficient to cover the additional costs. Opinion is about equally divided as to whether fair practice provisions in various codes are being observed and many are apprehensive of the ability to enforce them. Some relief from the overbearing tactics of buyers in asking constantly lower prices is evident throughout the industry. Other questions raised cover the probable actual administration cost in increment of pounds of castings that will be entailed by the thorough and active enforcement. Obviously, this burden cannot fall upon the trade association members alone, particularly in the gray iron and nonferrous divisions. The foundry industry is willing and receptive toward NRA, but still solicitous and alert toward administrative proceedure.

Plan Tour for Overseas Foundrymen

(*Concluded from page* 18)

equipment and supplies, according to C. E. Hoyt, executive secretary of the A. F. A. The association recently mailed an exceptionally attractive folder to the equipment and supply industry, outlining the splendid facilities offered at Philadelphia for staging the important International congress, and extending an invitation to exhibit at the congress and exposition.

Announce Meeting Of Purchasing Agents

Plans for the 1934 convention of the National Association of Purchasing Agents, to be held in Cleveland the week of June 18, are being prepared under the direction of Ralph G. Sweeney, purchasing agent, Allyne-Ryan Foundry Co., president of the Purchasing Agents Association of Cleveland and general chairman of the convention committee.

All convention sessions and the show will be housed in the Hotel Cleveland.

Code Authorities Confer

(*Concluded from page* 17)

ing to make up the losses on sales to small buyers. Finally, open prices make quality a prime factor and place responsibility on sales effort.

In all of the open price discussion, the line was drawn sharply between the retail and the manufacturing viewpoint. Frank A. Bond, secretary, chain manufacturers' code authority declared that open prices are absolutely vital to codes and if open price provisions are eliminated, nothing will be left. He maintains that a reasonable waiting period is necessary to curb chiselers. He holds that prices are sure to be uniform and that under codes they will be uniform at a dignified level, while under unrestrained competition they will be uniform at the level of the lowest price offered by the worst chiseler. He resented the imputation that code authorities seeking some right of price control are dishonest and not to be trusted, stating that they would live up to their trust.

States Primary Purposes

Donald R. Richberg, NRA Council, in opening the first of a series of administration sessions stated that the primary problems of NRA at present are to secure proper compliance, provide safe method of financing without abuse or intolerable expense, secure adequate representation of labor and consumers upon code authorities and to avoid the creation of bureaucracy either of government or industry. Dr. Walton R. Hamilton, speaking for the consumers board held that the consumer is properly an important factor in any industry with equal rights with those who gain their livelihood therein. He said that competition is such a good thing that the only fault today is that there is too little of it. While a return should be made to labor and to management, there is too much under the present setup to perpetuate inefficiency and to base costs upon idle capital and plant facilities. He urged full consumer representation upon all code authorities.

John L. Lewis, speaking for the labor advisory board recommended that labor be given membership on code authorities with full power to vote. He further urged that all code authorities should be compensated through an ad valorem tax to be levied and collected by the government from the respective industries on which they serve. He further suggested local compliance boards set up by industries, the abolishment of the northern and southern wage differentials, the establishment of industry and national economic councils and national planning boards, a 30 hour week and government price control all the way through industry.

One of the most pressing problems in the experience of code authority members, obtaining sufficient financial support to enable them to function, was stressed at the meeting on code administration held Tuesday, under charimanship of Alvin Brown. Blackwell Smith of the legal division explained that the application of government by default should not be permitted to govern in code administration. If industry does not take an active part, it will participate under the law, but will have no control. If industry is to be self governing it must have the wherewithal.

Several speakers outlined their experience. The shoe manufacturers collect 0.01 per cent on gross sales of 1932 in an industry with 800 members. The bituminous coal industry assess 3 mills on each ton of coal, collecting $210,000 to administer an industry with an annual business of $625,000,000. Hosiery collects 0.1 per cent on 700 plants to yield $210,000.

The unfortunate angle from the administration point is that assessments may be considered as a tax levy, which some hold is a province of the government which cannot be assigned.

The revival of the blue eagle insignia, carrying code numbers is in prospect with the accompanying statement of the administration that this emblem is to be regarded as a mark of distinction, awarded to those that are co-operating.

W. H. Davis, national compliance director enumerated the duties of code authorities, stating that theirs was not to enforce but to secure compliance, and to protect the public interest. Interpretations must come from Washington, and the channels of adjusting complaints were set forth.

Pour Metal After Adding Phosphor Copper

Production of an alloy in accordance with specification B-22-21 of the A. S. T. M. in a coke fired crucible furnace is accomplished as follows. The specification calls for 82 per cent copper, 17 per cent tin and 1 per cent phosphorus.

Melt the copper and before adding the tin, add phosphorus copper so as to add ¼ of 1 per cent of phosphorus. If 10 per cent phosphor copper is used, 2½ pounds of phosphor copper per hundred would be required. Add tin, stir well and keep the bath covered with pulverized charcoal after adding the tin. Just before pouring, an additional amount of phosphor copper should be added, which would provide for the 1 per cent of phosphorus desired in the final alloy. This would mean 10 pounds of 10 per cent phosphor copper should be added per 100 pounds of melt at this point.

After thoroughly stirring the alloy, it should be poured immediately and not allowed to soak or stay in the furnace any longer than it is absolutely necessary. It is important in the manufacture of such alloys to melt the copper as rapidly as possible and not to superheat the bath any more than is necessary, as this increase in temperature above that desired increases the oxygen content of the copper, which upon the addition of the phosphor copper combines with the phosphorus and reduces the final phosphorus content. It is well to see that the flue is not obstructed in any way to prevent a rapid and complete combustion of the coke, as the rapidity of the melting is important where it is desired that the oxygen content of the copper be held at the minimum.

In melting such alloys in a coke fired crucible furnace, a small amount of pulverized charcoal is helpful if it is placed in the bottom of the crucible when the copper is placed in the crucible. The charcoal rises as the metal melts and floats over the bath throughout the process of melting. Many crucible fires are not provided with ample draft and consequently the speed of melting is not of the best.

It should be borne in mind that the more rapidly the metal can be melted, the less time it is exposed to furnace gases. If the copper was melted properly, after adding the first quarter of one per cent (¼ of 1 per cent) of phosphor copper, there should be a small amount of this phosphorus left in the bath so that when the 1 per cent is added later, none of that 1 per cent is consumed in reducing the oxygen content of the copper and consequently the castings will be found to contain their required percentage of 1 per cent specified in the A. S. T. M. specifications.

Approves Simplified Practice in Refractories

Simplified practice recommendation R154-34 covering "Cupola Refractories," has been accorded the required degree of written approval by the industry, and will become effective March 15, 1934, according to a recent announcement of the division of simplified practice, bureau of standards, Washington. The recommendation was proposed and developed by the industry and covers the sizes and shapes of cupola lining blocks, tap-out, and slag-hole blocks.

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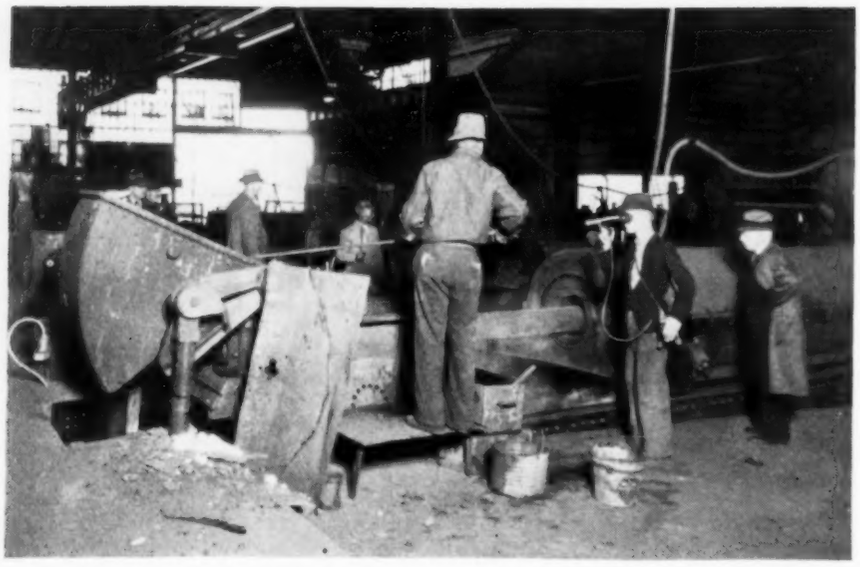


Fig. 3—Casting end of the machine showing long spout which carries the metal into the mold. Metal temperatures are controlled closely.

Coat Iron Pipe Mold with Powder

(*Concluded from Page* 23)

socket core system is located at the end of the unit and includes ovens, sand handling equipment, blacking tables, etc. The sockets after being rammed at the tables are blackened and placed upon trays. They are then transported by an electric lift truck to the ovens where they are baked, and subsequently transported to the side of the super deLavaud machine, ready for use.

A modern annealing furnace, with necessary appurtenances, has been installed in a new building, in close proximity to the centrifugal casting machines. To obtain this desired location it was necessary to raze a portion of the original structure. To accurately record the weight of all pipe cast, a scale is installed directly preceding the annealing furnace. The furnace is operated with gas as its fuel and is actuated through a system of thermocouples automatically, so that the variation in temperature at no time exceeds 20 degrees Fahr.

Pipe Follows Routine

From the annealing furnace, the pipe, moving in straight line production, passes through the various operation of cleaning, coating and testing, for which the most improved equipment has been installed. After weighing, the pipe is transported to the storage yard or loaded for immediate shipment, as desired.

Since considerable water is used in the operation of the unit, a recirculating system has been installed, which consists of a large pond equipped with spray nozzles, so that the water in the summer time can be cooled readily. This system is capable of distributing water at either low or high pressures, according to requirements.

The annealing furnace and core ovens were constructed by the R. & S. Products Co., Philadelphia. Structural steel was supplied by the Virginia Bridge & Iron Works, Roanoke, Va. Cast-iron roof plates, a new product of the United States Pipe & Foundry Co., were used in roofing the new unit. The engineering department of the company designed the unit and supervised the general construction.

Book Review

Great Men of Science, by Phillip Lenard, cloth, 389 pages, 6 x 8½ inches, published by The MacMillan Co., New York and supplied by THE FOUNDRY for $3 plus 15 cents postage, and in Europe by the Penton Publishing Co., Ltd., Caxton House, Westminster, London, W. C. 2.

This historical study by Prof. Lenard, formerly professor of physics, University of Heidelberg, Germany is translated from the second German edition by Dr. H. Stafford Hatfield, at one time a student with Heinrich Hertz under Prof. Lenard. A careful search has been made by the author of original and source material in assigning place in his work to those who have brought forward something new, having a definite bearing upon the knowledge of nature, the scheme of the universe and the position of man in nature. The period covered ranges from 570 B.C. to the present generation and included more than fifty who measure to the stature of Prof. Lenard's requirements for recognition. Those still living are omitted. from the discussion.

The author notes a similarity in character and spirit actuating these giants of science, whether they be from the dim remote past when men died for daring to think in advance of their contemporaries or whether they are among those who were late contemporaries of the present student of science. Enough of biographical information is included on the subject of each of the fifty or more word pictures to enable the reader to view him as a man in relation to his time and thought. Portraits of practically all of the men of science are reproduced, some of them for the first time in other than museum reference works.

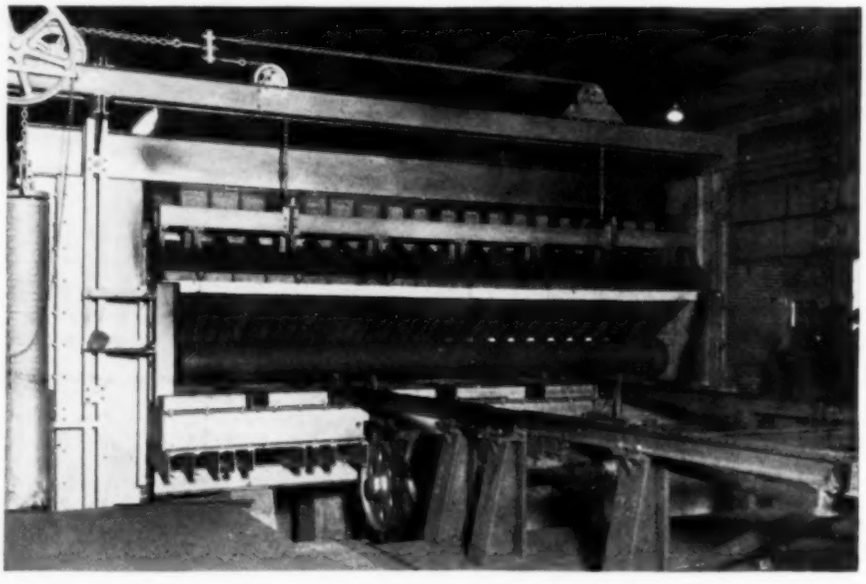


Fig. 4—A section of cast iron pipe made in the centrifugal machine entering the continuous type annealing furnace

ADVERTISING MATTER REMOVED

Distributing Molding Overhead

(*Concluded from Page* 21)

that we have satisfied ourselves that there is a wide difference in cost by the two methods, let's see how much it would cost to figure jobs on hours instead of labor."

Dick—"I can't see where it would take any more time to multiply the hours on a job by a rate than to multiply the labor by another rate."

Tom—"That's true, but how you going to get the hours to multiply by a rate?"

Dick—"How do we get the labor?"

Tom—"On day work jobs, we multiply the time by the labor rate of the type of man to be used on that job."

Dick—"You admit you have the time, else you couldn't figure the labor cost."

Tom—"You win."

Dick—"That's that, now how do you figure the labor cost on piece work to get something to multiply your overhead rate by?"

Tom—"You give us that figure."

Dick—"So I do, but don't forget that my piece rates are all based on the time required to make the mold."

Tom—"But you never report it."

Dick—"You said you didn't want it."

Tom—"How much would it cost to get the time on each piece rate you set?"

Dick—"Just as long as it takes to push my pencil through about 4 digits."

Tom—"Suppose we should want to keep time on jobs in your department. How many clerks would it take?"

Dick—"Monarch has about 50 molders and their molding foreman told me he had one clerk who makes out the orders, keeps time and does some other odd jobs for him. Says the clerk has some spare time. So I think we could accomplish as much with our 55 molders."

Tom—"That sounds reasonable. I know we have lost enough profitable orders and accepted other losing ones to many times pay for the clerk. Say we put it up to the boss."

Dick—"Something's wrong with our common sense if we don't."

Metallurgical Engineers Hear Talk on Ancient Iron Manufacture

TECHNICAL problems relating to iron and steel and allied products were discussed at the 143rd meeting of the American Institute of Mining and Metallurgical Engineers, in New York, Feb. 19-22. Eight sessions were devoted to the iron and steel division, including the Howe memorial lecture, presented by Dr. F. N. Speller, director, department of metallurgy and research, National Tube Co., Pittsburgh, on the subject of the corrosion problem with respect to iron and steel.

Howard N. Eavenson, fuel expert and a member of the consulting engineering firm of Eavenson, Alford & Hicks, Pittsburgh, was elected president to succeed Dr. Frederick M. Becket, vice president, Union Carbide & Carbon Co., New York. Louis S. Cates, president, Phelps-Dodge Corp., and Karl Eilers, consulting engineer, both of New York, were elected vice presidents of the institute.

The Saunders medal was awarded to Pope Yeatman, consulting engineer, New York, for distinguished achievements in mining. Dr. Albert Sauveur, Harvard university, Cambridge, Mass., and Karl Eilers were awarded certificates of honorary membership and Earl W. Palmer and Cyril Stanley Smith, research workers with the American Brass Co., Waterbury, Conn., the Robert Woolston Hunt prize for their paper on "The Precipitation-hardening of Copper Steels." Benjamin J. Harlan, Bethelehem Steel Co., Lackawanna, N. Y., received the J. E. Johnson Jr. award for a study of the use of sintered iron ore in blast furnace practice.

In the annual address of the retiring president, Dr. Becket appealed to the engineering fraternity to work for a planned economy. "Restoration and maintenance of economic security," he said, "is the principal concern of the nation today and the engineer should contribute to the solution by reason of his qualifications to grapple with the problem that harasses wage earners, engineers and employers alike."

Investment in over-expanding facilities, costly selling, profitless competition, wasteful distribution, long-term borowing for short-lived improvements and mounting taxation to meet increasing cost of government are evils which the engineering profession can combat, Dr. Becket declared.

Wide public belief that iron castings first were made in Germany in the Middle Ages is entirely erroneous, according to Dr. Thomas T. Read, Vinton Professor of Mining at Columbia university, New York, speaking on "Ancient Cast Iron." Dr. Read showed lantern slides of many cast iron objects, disinterred from Chinese graves, that were of earlier origin than the second century, A. D.

Many people falsely suppose that cast iron first was used in Europe for making cannon. The first dated cast iron cannon known is Chinese, cast in 1377 A. D. The Chinese made many large iron castings before that time, among them statues, variously dated from 1000 to 1200 A. D., and a large iron bell, dated 1079 A. D.

The largest cast iron statue of which there is any record, Dr. Read said, is a fanciful lion, 18 feet high and 20 feet long. This was cast between 950 and 960 A.D. in atonement for a crime which a rich man had committed. Literary records carry the casting of iron in China as far back as the sixth century B.C. Dr. Read attributed the early development if iron castings in China to phosphorus in the coal in the region where cast iron first was made. This produces an iron that melts at a temperature almost as low as that of bronze, whereas in other countries, where charcoal was used as fuel and the resulting iron contained little phosphorus, its melting temperature would be so high that bronze workers could not melt it.

Dr. Read further suggested the possibility that the iron workers of Shansi, China, made cast iron before they made wrought iron and steel, thus reversing the relation that holds in every other country of the world. Iron weapons were used in other countries long before they were in China. When they first appeared there it was in a different part of the country from where iron first was made, and distant from the phosphorus-bearing coal that made the casting in iron possible. If this can be proved to be true by further archeological excavations it will throw much new light on the beginnings of iron metallurgy.

Publishes Index To A. S. T. M. Standards

The American Society for Testing Materials, 260 South Broad street, Philadelphia, recently has published its annual index to A.S.T.M. standards and tentative standards, including specifications, methods of testing, recommended practices, definitions of terms and charts and tables. Each specification and test method is indexed under the principal subject it covers.

Moves Toronto Branch

The Toronto branch of Frederic B. Stevens, Inc., Detroit, has been moved from 139 Royce avenue to larger and more convenient quarters at 361 Sorauren avenue, Toronto.

How can she lose in that rig?

The Adventures of Bill

BY PAT DWYER

CASUAL reference to a recent newspaper story dealing with the activities of a lady in an effort to secure a divorce and $7500 per month alimony prompted Bill to remark that it is about time for a sweeping revision in the present laws of the land and a return to an earlier, simpler and more nearly adequate method of dispensing justice.

"Under the present system," he claimed, "a legalized form of piracy and blackmail is sanctioned to the extent that when a woman for any one of a hundred reasons—or no reason at all—tires of a husband she calmly can repudiate a presumably solemn contract. Further, even if she only weighs 100 pounds soaking wet and with a rock in each hand, she can set the ponderous machinery of the law in motion to compel the husband to support her for the remainder of her life. Not only support her, but supply her with luxuries totally unknown in her happy girlhood days, luxuries which she never even could have hoped to attain through her own efforts.

"Where a man divorces a woman for his own selfish interest, he should pay and pay heavily, but surely the court should have common sense enough to differentiate between cases demanding justice, and cases without a single legitimate leg on which to stand.

"From an ordinary man's standpoint it would appear that the judge parks his modicum of common sense in the alley with his car, and from the bench delivers judgment based on his interpretation of legal quibbles and technicalities.

"Even where a judge retains his sense of justice he sometimes is forced by a jury to render a decision against his own convictions."

"I think you are going too far there," I said. "A lone judge is as fallible as any other person. With his presumably intimate knowledge of the law he feels bound to render a decison in accordance with the law's technicalities as presented by counsel for the plaintiff and the defendant. However, the decision of a jury should be different. They are not learned in the law. They are ordinary people with the ordinary person's sense of justice and fair dealing. Off hand I should be inclined to say that the unanimous decision of twelve men and women should be as near approximate justice as any person reasonably could expect."

"Is that so?" The scornful inflection seemed to imply that in Bill's opinion the Babes in the Wood were models of erudition in comparison with some people he could mention if he was so minded.

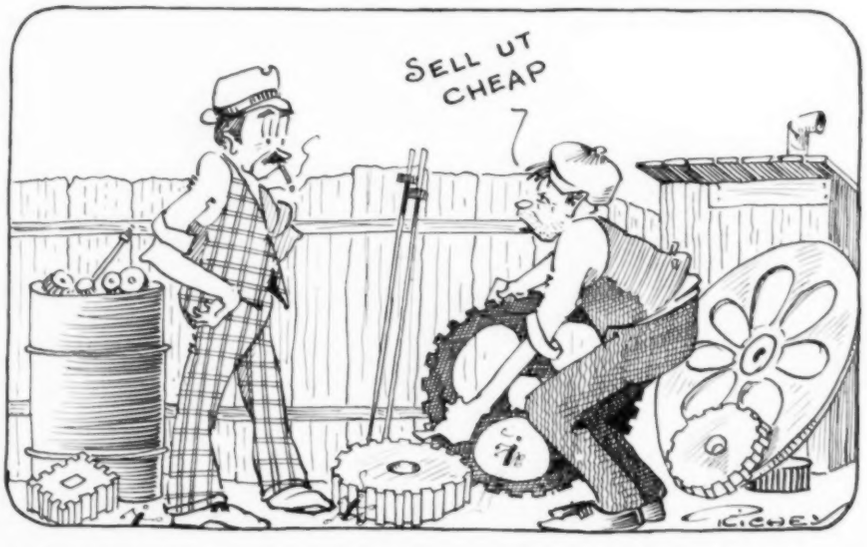
"Is that so? Say, listen. You remind me of something I saw in a paper one time describing the difference between an engineer and a salesman.

"An engineer is said to be a man who knows a great deal about very little and who goes along knowing more and more about less and less until finally he knows practically everything about nothing. On the other hand, a salesman is a man who knows very little about a great deal and keeps knowing less and less about more and more until finally he knows practically nothing about everything.

"Purry good, I calls it," Bill continued complacently. "Fits a lot of people, if you ask me. You think a trial by jury guarantees more even-handed justice than a trial by a judge alone, eh? I'll just quote you one instance—I might quote forty, but one will do—I'll just quote you one instance of a case described recently in some of the papers where a jury rendered a verdict of acquittal to a guilty person.

"This light-fingered gent was arrested for robbery and at the preliminary examination admitted his guilt. An ordinary person might think that was enough. Away with him to the penitentiary. However, the law does not operate in that manner. His case had to be disposed of according to the standard formula of going through a formal trial, with a learned counsel sitting in each pan of the scales of justice and with a jury of his peers to see that neither of these learned gents introduced any shenanigans, lead soles on the shoes, packages of buckshot in the pockets or other devices to increase the avoirdupois. Fat chance a jury has to catch one of these experts!

"At the trial, the lawyer for the defense entered a plea of not guilty and argued his case so skilfully that the



All here but silver cart wheels, the old spinning wheel and the wheel of fortune

jury was convinced of his sincerity and of the innocence of the prisoner. They brought in a verdict of acquittal. Under the rules the judge had no other option than to discharge him, even though personally he was convinced the prisoner was guilty of the crime as charged.

" 'In accordance with the verdict,' he said—and I guess he was fit to be tied. 'In accordance with the verdict, I must release you, but,' he shook his finger in scornful and bitter emphasis, 'in the eyes of the court and of all honest men you bear a double stigma. According to your own admission you are a thief, and according to the verdict of the jury you are a liar. Take him away.' "

"Is that the end of the story?"

"Certainly! How did you expect it was going to end?"

"Oh, I thought perhaps you were going to say that when these stinging words fell on the prisoner's ears he jumped to his feet in a graceful interpretation of 'The Dance of the Hours' which carried him through the doorway gaily singing 'Who's afraid of the big, bad wolf.' Every story should have a happy ending."

"All right," Bill grunted. "Figure out a happy ending for this one I came across recently in a technical magazine, dealing with cutting and welding.

Confronted with the need for a crane dog gear or ratchet wheel 18½ inches outside diameter and 2 inches thick and having a 10½-inch diameter inside hole, a well known railway shop decided to produce it by cutting it from a 2-inch steel slab using oxy-acetylene machine cutting. A cost record of the job is not available, but an analysis of the cost of duplicating is of interest. A 20-inch square slab of steel 2 inches thick would weigh 115 pounds and would cost $4.15. Shaping of the teeth would require about 98 inches of cutting and the hole about 33 inches. Thus 55 cubic feet of oxygen and 6 cubic feet of acetylene would be used, costing 55 cents and 12 cents, respectively. One hour of labor at 75 cents, 3 hours for a draftsman $2.25 and $4 overhead on labor and machine would bring the total cost up to $12.12. If the gear had been made from a forging and machined in the conventional manner, the cost by conservative estimate would have exceeded $80 and might have been as much as $100.

"Well," I said, " 'Twould seem to be an ingenious method for getting around an emergency job, but some of the figures seem to be out of line."

"Out of line? They are out of line, out of plumb and out of all reason. I think they were just snatched out of the air. Take a look at that slab of steel and figure the weight. In the good old days before NRA a dollar was worth 100 cents, and a cubic inch of steel weighed 0.28-pound. Recently the value of the dollar has depreciated to 60 cents and I am wondering if the able young lad who figured the weight of the slab thought he was working with money instead of steel. If this surmise is correct, he is a heavier slasher than the President. He has reduced the weight of steel almost 50 per cent. Perhaps his slippery slide rule slipped.

"How come? Sez you. Well, look at the figures. Under the old regime—and I imagine the custom still is in

Figures are not always what they seem

vogue in some places—a man would compute the weight of a steel slab 20 inches square 2 inches thick as follows: 20 x 20 x 2 x 0.28 = 224 pounds. Thus instead of 115 pounds at 3 cents per pound, a total of $4.15, it would be necessary to amend the bill to read 224 pounds at 3 cents, a total of $6.72.

"A high degree of courage and optimism is shown in the estimate of 3 cents per pound for this particular steel slab. Possibly the piece under discussion was on the premises, and therefore the valuation is purely arbitrary. Steel plate 2 inches thick is a fairly common commodity and is stocked by large steel warehouses in various parts of the country. However, many plants are located at a considerable distance from any warehouse and I do not think that shippers are in habit of paying the freight. A rolling mill does not sell its product in the form of 20-inch square slabs. Therefore, the customer would have to pay for the cost of cutting this 20-inch slab from a large plate. At a fairly conservative estimate we may add $1 for freight and $1.50 for cutting, or a total of $9.22 for the slab laid down on the customer's cutting bench.

"I am not going to comment on the astonishing speed and skill of the operator who cut a hole in the center of the slab and cut a row of teeth on the perimeter in an hour, but I think the railroad company is to be congratulated on selecting a location for its shops where oxygen can be bought for 1 cent per cubic foot and acetylene for 2 cents. Out in this part of the country oxygen in tanks for industrial use is quoted at $1.85 per 100 cubic feet. The price of acetylene is $3 per 100 cubic feet.

"Of course the possibility always remains that the same faulty slide rule used in computing the weight of the steel, also was employed in computing the price of the gas. However, facts are facts, and therefore we reluctantly are forced to tack a few additional dollars on the total cost of the job. Instead of 55 cents and 12 cents, the revised figures will read $1.01 and 18 cents. With the foregoing slight but apparently necessary revisions we might set down the two sets of cost figures in parallel columns for comparison:

$ 4.45	Steel	$ 6.72
.55	Oxygen	1.01
.12	Acetylene	.18
.75	Labor	.75
2.25	Draftsman	2.25
4.00	Overhead	4.00
.....	Freight	1.00
.....	Cutting	1.50
$12.12		$17.41

"Now, we come to the concluding and most extraordinary statement of all: 'If the gear had been made from a forging and machined in the conventional manner, the cost by conservative estimate would have exceeded $80 and might have been as much as $100.'

"There is just about as much sense in making that comparison as there would be in saying, 'If the gear had been made from gold or silver with diamond or ruby teeth, the cost would have been thus and so.' In other words, if any person told the master mechanic that the gear was going to cost him $100, he probably would reply in classical railroad language, 'Nertz to you. I can get a second-hand crane for that amount.'

"At a conservative estimate the rough forging would cost about $10 and a man would cut the teeth on a shaper in about a day, and we are asked to believe that would cost from $70 to $90.

"By heck! Thar must be a mint o' money in them thar machine shops.

"With the opportunity of getting a cheaper, better product and at a considerably lower price one is moved to wonder why apparently no consideration was given a steel casting. The old casting would serve for a pattern, or if that was not available a suitable pattern could be cut on the bandsaw in half an hour. The casting weighing about 95 pounds could be molded, poured and delivered on the same day if necessary and at a total cost of about $10. Also the casting would present a smoother and more finished appearance than any gear chopped out of a blank with a torch.

Pouring Temperatures of Bronze

(*Concluded from Page* 25)

melting point. It usually appears as a surface layer on the casting, but may also be found in form of inclusions near the surface. Francis W. Rowe describes a case of tin sweat in a 1-ton phosphor-bronze casting which formed a layer 18-inches long, 2 to 3 inches wide and more than 2/5 inch deep in places.

By adding 2 per cent of phosphorus to 80-10-10 bearing bronze mixture and retarding the cooling of the metal the writer was able to remove about 2 per cent of lead (20 per cent of the lead content of the alloy) by liquation and segregation at the bottom of the crucible. This process easily may be repeated if sufficient heat isolation is being supplied to assure of a freezing interval of about 8 to 10 hours. It appears possible that by subjecting the crucible to vertical shocks during cooling a much larger percentage of lead may be made to segregate.

The total shrinkage of all metals and alloys varies with the rate of cooling. The more rapid the cooling the larger the shrinkage of most alloys. Table III gives the total shrinkage of some copper alloys (bronzes and brasses) cast in sand and chill molds respectively.

Studying the above table it will be noticed that the difference in the shrinkage of sand castings vs. chilled castings decreases with rising pouring temperatures, a fact doubtlessly due to the larger heat reserves in the hotter metal which equalizes somewhat the chilling effect of the metal mold.

This is the first of two articles by Mr. Thews on the subject of pouring temperatures. The second will appear in an early issue.

THE EDITORS.

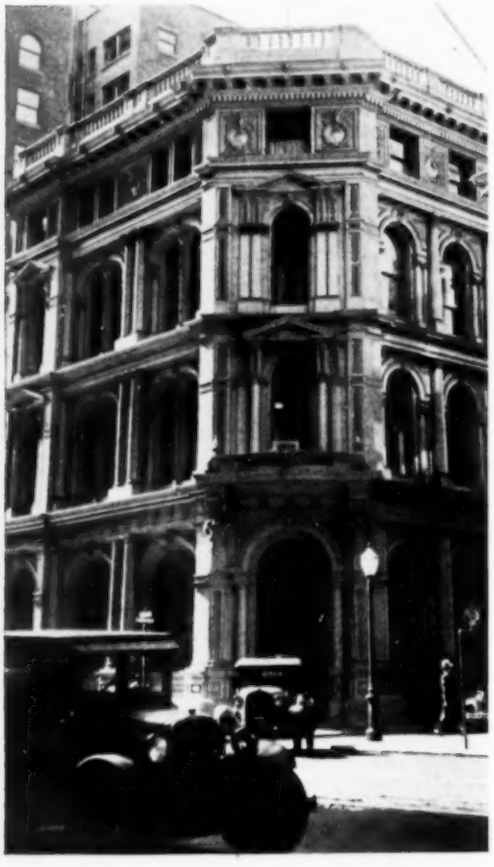


Fig. 3—The building as it appears today with the fourth story added

Application of Soda Ash Discussed

Unusual interest was shown in the regular meeting of the Quad-City Foundrymen's association held at the Fort Armstrong Hotel, Rock Island, Ill., on Feb. 19. The meeting was addressed by G. S. Evans, Mathieson Alkali Works Inc., New York, who spoke on "Soda Ash in the Foundry" and by John Ploehn, French & Hecht Inc., Davenport, Iowa, who talked on "Apprenticeship in the Quad-City Area." Mr. Evans traced the developments of fused soda ash through a decade of observations in the iron and steel industry. He discussed the effect upon the metal when applied in the ladle, openhearth or cupola and stated the material offers a means of lowering mixture costs, improving melting conditions and giving better castings. The speaker showed through tables the application of fused soda ash to various iron mixtures Many questions followed the presentation of the paper.

Mr. Ploehn, who is chairman of the educational committee of the Tri-City Manufacturers' association and a member of the apprenticeship committee of the American Foundrymen's Association, pictured the importance of training young men at this particular time, when it has been found that many districts are short of good mechanics. Because of that need Mr. Ploehn recommeded that all members take a particular interest in starting some apprentices.

The next meeting, which will be held jointly with the technical societies of the Tri-Cities for the purpose of discusing the "Cast Iron Symposium" is scheduled for March 19 at Davenport, Iowa.

Reviews Progress in Use of Alloys in Metals

Frank B. Coyle, development and research department, International Nickel Co., and George Geiger, of the same company, addressed the members of the Philadelphia Foundrymen's association at a meeting in the Manufacturers and Bankers club, Philadelphia, on Feb. 14. C. Walter Yost, Reading Iron Co., and president of the association, presided.

Mr. Coyle spoke on "American Progress in the Use of Alloys in Cast Iron." The talk was based on the American exchange paper to the Institute of British Foundrymen for 1933. The paper covered the use of alloys in general castings production, high test and high strength cast irons, heat resistance cast irons, corrosion resistant cast irons, heat treated cast irons, and white and chilled cast irons.

Mr. Geiger spoke on "Use of Alloys in Nonferrous Metals."

Is Made Manager Of Chicago Office

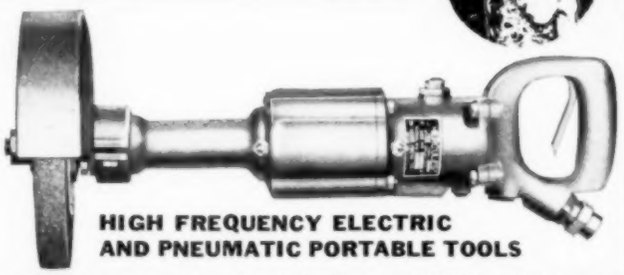
Henry Clarke has been appointed resident manager by the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., at its district sales office opened March 1, at 333 North Michigan avenue, Chicago. Mr. Clarke was graduated from the Georgia School of Technology and was first employed as chemist by the Atlanta Steel Co., Atlanta, Ga. Later he became metallurgist for the American Machine & Mfg. Co., Atlanta, afterwards serving as metallurgist for the National Cast Iron Pipe Co., Birmingham. Prior to being associated with the Sloss-Sheffield Steel & Iron Co., Mr. Clarke was with the research department of the Stockham Pipe & Fittings Co., Birmingham. For the past 4 years he has been asociated with the sales department of the Sloss-Sheffield company, where he has gained wide experience in the metallurgy of gray iron castings production.

Cast Iron Building Serves for 60 Years

(*Concluded from Page* 26)

side of the entrance, are cast iron with the cast mark: "Hinckley and Company, Fulton Foundry, San Francisco 1873." Sixty years old and yet, the structure is still staunch and sturdy, for cast iron never wears out. It may be razed by the hand of man, to make way for a larger and gaudier, but no more permanent, structure.

HERCULES



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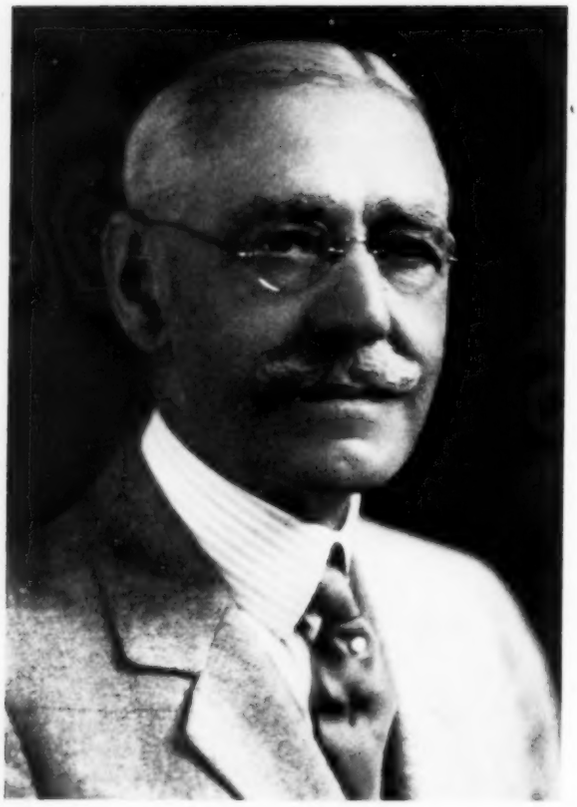

Frederic B. Stevens, Pioneer in Supply Industry, Is Dead

FREDERIC BECKWITH STEVENS, founder and president of Frederic B. Stevens Inc., Detroit, which has for the past 50 years been engaged in the manufacture and sale of foundry equipment and supplies throughout the United States and Canada, died in his sleep at his home in Detroit on Thursday morning, March 1. He is survived by his widow, Anne Shipman Stevens, and by one daughter, Mrs. Lewis H. Kirby of Kalamazoo, Mich.

A pioneer in the foundry supply field, he was known to thousands of foundrymen through his active interest in the castings industry extending well over half a century. In Detroit, his adopted city, he was recognized as a leader in the industrial, financial, social, religious and fraternal life of the community.

Descended from Colonial Stock

Mr. Stevens was 78 years old. He was born in Canton, Conn., Sept. 24, 1855, and came of old Colonial stock. His mother, Mary Beckwith, was related to the famous Beckwiths of Georgia. He received his early education in the public schools of Collinsville, Conn., and in 1873 was graduated from Williston seminary, East Hampton, Mass. He then began his long and useful business career in a wholesale carpet store in Hartford, Conn., and three years later went to Brooklyn, N. Y., where he was engaged in clerical work.

The urge to strike out for himself became so engaging that in 1876 he moved on to Detroit where old friends from New England already had settled. His first job in that city and his first contact with the foundry industry was with the Detroit Stove Works, where he remained until 1882. Then, at the age of 27, he organized his own business and began the manufacture of foundry facings and supplies. Since that start he has dominated the activities of the business which has spread throughout the country.

A man of great capacity for work, Mr. Stevens was interested in many activities beyond the demands of his successful business. From boyhood he experienced a deep interest in dramatics and a love for the stage. During his stay in Brooklyn he joined the Garrick Dramatic club and soon became one of its stars. For some time he debated whether to follow the stage, but a shrewd Connecticut instinct tempered his judgment. Nevertheless he carried this hobby to Detroit, and soon was considered one of the finest amateur actors in that Michigan metropolis.

He was an exceptional student of human nature and a briliant writer; attracting attention to his business and products through unusual advertising copy. In 1915 he issued the first of his famous *T* books entitled *This and That*, to be followed a year later by *That and This*. Six or seven others along a similar vein followed over a period of 10 years.

Another accomplishment is exemplified in his years of service in the various bodies of the Masonic fraternity. Last year he retired as Acting Most Puissant Sovereign Grand Commander of Scottish Rite Masonry for the Northern Jurisdiction, the highest honor conferred by that body. He was elected to the new term but declined to accept because of his years.

Interested in Many Enterprises

Mr. Stevens was a director of the Equitable Trust Co., the Michigan Fire & Marine Insurance Co., the Michigan Valve & Foundry Supply Co. and was financially interested in many other companies in Detroit and Michigan. He was a lifelong Democrat and while he never sought public office, in 1923 he accepted the position of Civil Service Commissioner from Mayor Frank E. Doremus.

Late in life when his business became well established, he devoted much of his time to numerous philanthropies. To his many friends, including those he so kindly helped, not alone financially but with advice, council and inspiration, the heading over a picture of Mr. Stevens in the March 2 issue of the *Detroit Free Press* tells the story of service and accomplishment:

"Life's Stage Loses a Great Figure."

Foundry Salesmen in the Making

(*Concluded from Page* 27)

memory a few technicalities for talking purposes.

In certain instances, it may be necessary for him to take technical particulars of a job that the estimators and experts in the foundry can quote properly without further inquiry. He may have to be present at a test, and see that it is reasonable and fair. What is more, he must be able to put himself in the buyer's place and, by his thorough understanding of industrial practice and engineering needs, indicate with accuracy how money may be saved by using appropriate castings; how they may be treated to better advantage; and the like.

It will at once be realized that the best way to sell foundry products is *not* to engage a group of general-product salesmen indiscriminately, and send them out without long preliminary training. The ideal man is one who has had several years of sound foundry experience, and who possesses in addition the vigor, energy, confidence, tact, and imagination, that alone give birth to salesmanship.

But how to discover this ideal—and not one, but a several of them? Men with foundry experience or with technical proficiency are not often fluent and versatile enough to make efficient salesmen. Good salesmen, on the other hand, seldom have the requisite practical knowledge. Nevertheless, two qualities are not essentially incompatible. The fault often lies in the attitude of the foundry management. Not enough attention is paid to the necessity for keeping up a steady supply of trained and intelligent salesmen.

Look in the Drawing Office

The true hunting ground for budding foundry salesmen is in the drawing offices. Every year, young men migrate from there to the works without ever being allowed to see that opportunities lie elsewhere for those who have the ability or the inclination. Yet there are hundreds of them who will never rise to more than an under-manager's post, although with a little training and encouragement they might make excellent foundry salesmen. The foundry salesman does not need to be an engineering genius. He needs only some works knowledge and experience—the groundwork that many of these young men acquire as a matter of course—plus those qualities previously detailed. It is much easier for a young man with works training to learn salesmanship than it is for a salesman to acquire works training under ordinary conditions.

It must be remembered, again, that in practice, if not in theory, the work of the foundry salesman includes much more than merely getting a buyer to send in orders. One important part of his work is to handle or investigate complaints. Any foundry, however excellent, is bound to receive a certain number of complaints. The trouble may be due not to faulty material but to careless handling, inefficiency, accident. To send the sales engineer or a foundry expert to investigate every complaint is costly and often impracticable. Obviously, in these instances the salesman has to take the place of the actual expert, yet to send an entirely unpractical man would be foolish. The salesmen must be able to tell whether the trouble is due to bad material or clumsy use.

Book Review

Proceedings of the American Society for Testing Materials, 1933, in two volumes, Vol. I 1092 pages and Vol. II 804 pages, 6 x 9 inches, published by the American Society for Testing Materials, Philadelphia, and supplied by THE FOUNDRY, Cleveland, for $5.50 per volume in heavy paper, $6 in cloth and $7 in leather, plus postage, and in Europe by the Penton Publishing Co. Ltd., Caxton House, Westminster, London.

Part I contains annual reports of 10 standing committees of the society, as well as research and sectional committees. Information is presented on various subjects in the ferrous metals field including the following: Steel, wrought iron, gray cast iron, heat treatment, effect of temperature, corrosion, malleable iron castings, iron-chromium-nickel and related alloys, zinc coatings and magnetic properties.

The report on cast iron gives the results of an extensive co-operative investigation on impact testing. This section contains a most comprehensive series of data on the physical properties of cast iron. Also of importance are the extensive data on corrosion as developed in the investigations on field tests of metallic coatings and total immersion tests; discussion of co-operative short time temperature-tension tests; and determination and significance of proportional limit and breaking strength in short time, high temperature tests.

The nonferrous metals section contains reports on corrosion, with extensive data from the results of atmospheric corrosion tests of metals exposed for 1 year; electrical heating and electrical resistance alloys, copper and copper alloys, and die cast metals and alloys. Information also is presented on committee work with refractories, fire tests of materials, and concrete.

Part II contains all of the formal technical papers presented at the 1933 annual meeting in Chicago, and also extensive oral and written discussions on the papers. The symposium on cast iron, which was sponsored jointly with the American Foundrymen's association, and was prepared by a committee of recognized authorities on gray iron, also is included.

Alloys of Iron Features A.S.M.E. Meeting

J. W. Sands, development and research department, International Nickel Co., New York, discussed new alloys of iron and steel at a meeting of the Anthracite Lehigh Valley section of the American Society of Mechanical Engineers at Wilkes-Barre, Pa., on Feb. 23. E. P. Humphries, supervisor of preparation, Lehigh Navigation Coal Co., reviewed results of a long series of experiments in the use of many types of materials, particularly metals, in connection with mining and preparation of anthracite coal.

Moves Conveyor Firm to Milwaukee

Chain Belt Co., Milwaukee, recently transferred the manufacturing operations of its subsidiary, the Stearns Conveyor Co., from Cleveland to Milwaukee. L. B. McKnight, formerly secretary and sales manager, Stearns Conveyor Co., and manager of conveyor sales for the Chain Belt Co. since the consolidation of the sales and engineering departments of the two companies in 1932, will continue in that capacity. George M. Dyke, vice president and operating manager, Stearns Conveyor Co., formerly a member of the Chain Belt organization, again will be associated with the latter company in an executive capacity.

Code Becomes Effective

Code of fair competition for the secondary aluminum industry became effective Feb. 23. Code authority for the industry recently was elected as follows: D. K. Ewing, Aurora Refining Co., Aurora, Ill.; W. A. McKnight, William F. Jobbins, Inc., Aurora, Ill.; J. B. Neiman, Federated Metals Corp., Detroit; W. A. Singer, Apex Smelting Co., Chicago; and Walter M. Weil, National Smelting Co., Cleveland.

A. S. T. M. Studies Corrosion of Metals

With a registration exceeding 450, the American Society for Testing Materials held a 5-day assembly of its various committees at Wardman Park hotel, Washington, March 5 to 9. In common with its practice for such committee assemblages, a program of papers was arranged, embracing at the session Wednesday the presentation of a symposium on outdoor weathering of metals and metallic coatings. The week's record of more than 130 separate conferences of committees and sub-committees covered the discussion of specifications, tests and inspection of materials ranging from rubber and concrete to practically all types of metals and metallic structures.

R. J. McKay, International Nickel Co., New York, and F. F. Farnsworth, Bell Telephone laboratories, New York, presided as co-chairmen at the symposium session. A general review of outdoor test results on bare and metal coated ferrous specimens was presented by C. D. Hocker, Bell laboratories, who presented his personal observations as to results without attempting a theoretical consideration of causes.

W. H. Finkeldey, Singmaster & Breyer, New York, pointed to the danger of assumptions based entirely upon short period tests. The initial corrosion of nonferrous metals slows markedly after the first year or two of exposure, whether measured by loss of weight or by reduction in physical properties. In general the corrosion of nonferrous metals in inland rural atmosphere is too slight to be of importance. It is in industrial regions and along the seaboard that corrosive effects take toll of nonferrous metals. In industrial regions the author favored lead, lead alloys, tin and aluminum bronzes, copper and copper rich alloys, commercial aluminum, aluminum coated duralumin and aluminum-manganese alloys in the order named for their corrosion resistance properties.

In marine atmosphere, the order of resistance was given as follows: Lead, lead alloys, nickel, nickel-copper, bronzes, copper-rich alloys, and commercial copper. In general, all the alloys investigated show a lower resistance to industrial than to marine atmospheres.

C. L. Hippensteel reviewed the method of condensing and presenting the results of galvanic coupe corrosion tests of committee B-3 on nonferrous metals.

At a dinner meeting at which Willard T. Chevalier, *Engineering News Record*, presided, Dr. Robert A. Brady, NRA consumers' advisor, stated that the consumers must gang up for protection. Industry has paid little attention to standards in writing codes, as only 70 have such provisions. These manufacturers have written covert price fixing or quality lowering provisions.

Consumers board will offer a standard clause demanding that all code authorities appoint committees with consumer and government representatives. These committees will report in a month and within a year will establish standards of quality, dimensions and labeling. Dr. Brady stated the consumer board reserves the right of judgment of the American Standards society and the American Society for Testing Materials standards which have been long established. As a plan to curb what it considers deliberate, malicious misrepresentation by manufacturers, consumers' councils now are being established on a county basis to receive complaints. Dr. Brady asked the A.S.T.M. to develop simple methods for checking results which will be capable of application in high school and college laboratories.

Book Review

Famous First Facts, by Joseph Nathan Kane, cloth, 757 pages, 5 x 8 inches, published in the H. W. Wilson Co., New York, and supplied by THE FOUNDRY, Cleveland, for $3.50 plus 15 cents postage and in Europe by the Penton Publishing Co., Ltd., Caxton House, Westminster, London.

This book presents an exceedingly interesting record of first happenings, discoveries and inventions, the information being presented in three ways. Famous first facts first are presented alphabetically with cross references to assist in locating the material. In the second, a chronological index presents information from 1007 to the present time. A third presentation consists of a geographical index in which first facts of the various states are presented, together with dates. The author suggests that both the chronological and the geographical indexes be used only as a guide to the main section of the book where more complete descriptions are presented.

Bureau To Continue Work of Simplification

Simplification and commercial standards work will be continued at the bureau of standards, in co-operation with the American Standards association and other organizations and groups concerned with that activity, according to a recent announcement of Lyman J. Briggs, director of the bureau. To provide maximum benefit for the ultimate consumer, the bureau in accepting simplified practice projects, will give priority to those which the producer groups will signify in advance their willingness to identify simplified items in their catalogs and other trade literature.

Moves Headquarters of Gray Iron Founders

The Gray Iron Founders' society, Cleveland, recently has moved to larger quarters on the tenth floor of the Public Square building, 33 Public Square, Cleveland. The new offices located in the down-town section will enable the society much more effectively to serve the industry in the administration of the code for the gray iron industry.

The gray iron foundry industry code was signed by the president on Saturday, Feb. 10 and became effective on Monday, Feb. 26, 1934. Copies of the code may be obtained from the society.

Hears Discussion On Chemistry of Iron

February meeting and dinner of the Pittsburgh Foundrymen's association held at the Ft. Pitt hotel, Feb. 19, featured an address on "The Chemistry of Cast Iron" by Prof. Robert B. Leighou, department of the chemistry of materials, Carnegie Institute of Technology, Pittsburgh.

In addition to Professor Leighou's paper, the Pittsburgh Foundrymen's group also viewed a motion picture entitled "Big Game Hunting in Canada", that feature was arranged by O. Nadolny of the Duquesne Pattern & Bronze Co., Pittsburgh.

Discusses Foundry Practice Before A. S. M.

The Detroit chapter of the American Society for Metals was addressed by Harry W. Dietert, Harry W. Dietert Co., Detroit, on Feb. 19. Mr. Dietert spoke on "Ferrous Foundry Practice" and discussed patterns, sands, binders, cores, methods of making molds, gating, risers, etc. He also spoke on methods of overcoming difficulties in the production of castings, pouring temperatures, control, chilled castings, centrifugal castings, permanent mold castings and recent developments in iron founding.

Opens District Office

Patterson Foundry & Machine Co., East Liverpool, O., manufacturer of pulverizing, grinding, mixing, clay working and processing machinery, has opened an office at Room 406, Basso building, 7338 Woodward avenue, Detroit. Edwin L. Grimes has been appointed district manager.

Louis H. Burkhart Jr. has been appointed representative in northern New York and western Pennsylvania and will make his headquarters at Corry, Pa.

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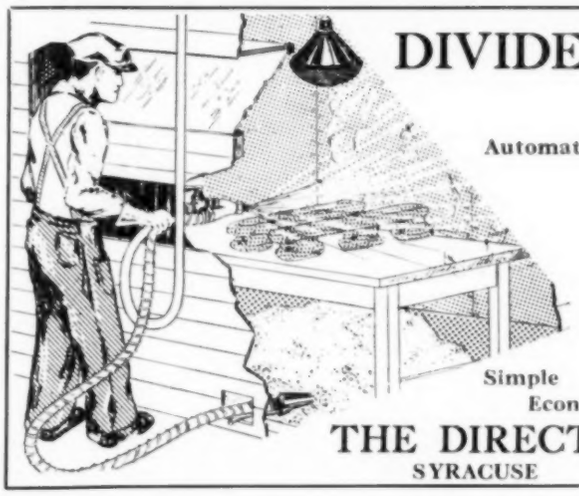

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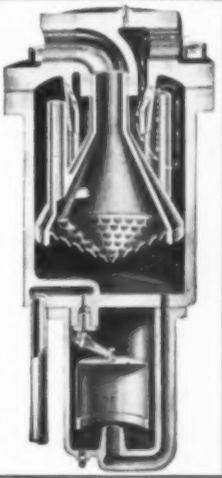

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European Foundry Practice

Digest of recent literature covering various phases of castings manufacture

Low Carbon Iron

Melting Low-Carbon Iron in the Cupola La Fusion au Cubilot de Fontes a bas Carbone, by R. Lemoine. *Bulletin* de l'Association Technique de Fonderie, Paris October, 1933.

The example taken is of an iron containing 2.60 per cent carbon with 2.2 to 2.4 per cent silicon. Experience has shown that it is possible in an ordinary cupola to obtain liquid cast iron with 2.6 per cent carbon, and a relatively high silicon content, with low content of phosphorus, and that such an iron can be poured easily in casting ¼-inch or more in thickness.

Steel scrap charged into the cupola is carburized in two stages: First, from the time charged until beginning to melt, pieces of scrap are subjected to cementation. If it is desired that carburation should be limited during this first stage, the temperature in the melting zone should be high; obtained by burning quickly a certain quantity of coke; at the same time increasing the pressure of air. In the second stage, the liquid metal goes through the melting zone and passes from one piece of coke to another, and during that period the carburation continues. The extent of carburation depends principally upon the period of contact with the coke. This second stage is important in the final content of carbon, and can be controlled in the cupola without a forehearth by successive teemings or by elevating the level of the liquid metal in the hearth by refractory bricks. The best method is to use a forehearth which is kept warm.

It is possible to obtain iron for castings with 2.6 per cent carbon by using charges which have as much as 60 to 70 per cent steel scrap. It has been found that the use of rusty scrap results in rapid deterioration of the lining. This can be overcome by adding sand to the lime, but the best way is to use scrap which is not rusty.

Charges containing a large percentage of steel have a tendency to absorb more sulphur than charges which are constituted with iron scrap. This tendency is lessened by the presence of high contents of silicon and manganese, and it is, therefore, advisable to use steel scrap of high silicon and manganese content, such as spring steel. Presence of silicon and manganese also avoids brusque variations in the carburation of scrap in the cupola.

Generally speaking, charges are composed of pigs, the composition of which is: Total carbon, 2 to 2.2 per cent; silicon, 1.50 per cent, manganese, 1 per cent. A current composition of charges is: 60 per cent of such pigs, 20 per cent iron scrap, and 20 per cent steel scrap, to which additions of ferrosilicon and, eventually, ferromanganese are made.

Such irons with low carbon can be prepared easily, provided a certain number of essential precautions are taken.

Centrifugal Castings

Manufacture and Application of Centrifugal Castings, by T. R. Twigger, *Foundry Trade Journal*, London, Dec. 7, 1933.

The author presents a brief survey of early attempts at centrifugal casting, discusses the life of molds, quality of the product, and some of the applications of centrifugal castings, such as in liners for cylinders, valve seats inserts, and brake drum liners.

Influence of Arsenic

Influence of Arsenic and Antimony on Cast Iron (Der Einfluss von Arsen und Antimony auf Gusseisen), by E. Piwowarsky, J. Vladeseu and H. Nipper, Archiv fur das Eisenhuttenwesen, November, 1933.

Literature dealing with the subject is generally in agreement on the point that arsenic makes the iron brittle, but that it is also capable of imparting to it a high corrosion resistance. It also is claimed, that antimony is still more detrimental to the mechanical properties of cast iron than arsenic. To clear up these points, cast iron bars were made up with varying contents up to 2 per cent arsenic and 1.2 per cent antimony, and exhaustively investigated.

It was found that arsenic, which is soluble in ferrite in the amounts investigated, exerts but a slight effect on the amount and state of the graphite or on the structure of the groundmass. Bending and tensile strength increase at first due to the arsenic, but drop again as the arsenic content is increased. Brinell hardness and modulus of elasticity as well as resistance to abrasion rise with the proportion of arsenic; the increase in resistance to the action of acids is more pronounced. Impact resistance and impact figure are affected adversely by arsenic, although not as much as through phosphor and sulphur.

Antimony opposes graphite formation and appears to be soluble in cementite. Bending and tensile strength, deflection and toughness are reduced appreciably by these elements. Brinell hardness, modulus of elasticity and resistance to abrasion on the whole are increased. The effect on corrosion behavior varies depending on the attacking medium.

Chromium in Iron

Chromium Additions to Cast Iron for Foundry Purposes, by J. E. Jurst, *Foundry Trade Journal*, Feb. 15, 1934.

Use of chromium in cast iron ranges from small amounts of the order of 0.10 per cent up to as much as 6 per cent and even higher in certain grades of austenitic cast irons. Various methods are used for adding the alloy to the metal, six of which are discussed in this article. These include the addition of 50 per cent ferrochromium in lumps approximately as large as a walnut; adding the ferroalloy in smaller lumps; remelting of scrap heads, risers and castings of chromium iron utilizing a refined alloy pig iron containing 2.75 to 3 per cent chromium; using

(*Concluded on page* 60)

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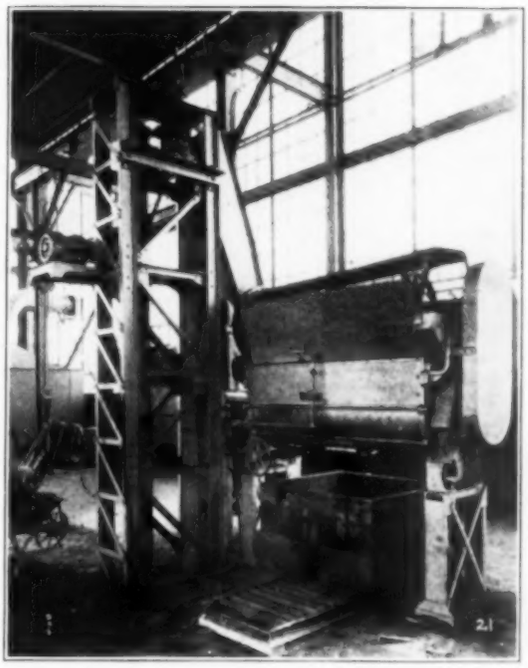

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a refined pig iron containing 2.75 to 3 per cent chromium and scrap from the previous mixture containing approximately 0.25 to 0.5 per cent chromium; and using a refined chromium alloy pig iron containing 8 per cent chromium. Loss of chromium in the latter case was 2.5 per cent of the calculated chromium content, which was the lowest in the six tests.

Tests Cast Irons

Castability of Cast Irons; (La Coulabilite des Fontes) report of a meeting of the Belgian research committee, *La Fonderie Belge*, Liege, November-December, 1933.

For the purpose of these investigations, the Cury test for castability was modified to increase the precision of the test. The test-piece was given a circular instead of a triangular section; the section was increased from 25 to 50 square millimeters; pouring was effected from a height of 175 instead of 110 millimeters; a special device was used for the gate. As a result of these changes, results were obtained with a precision of 1 per cent, and for a change of 10 degrees Cent. in the pouring temperature there was a change of 4 centimeters in the length of the test-piece.

Numerous tests developed two qualitative laws: (1) For a given temperature, castability increases with the contents of carbon, silicon and phosphorus, and it is in relation to the temperature of the metal when it leaves the furnace; (2) For an iron of a given composition, castability decreases with the pouring temperature.

The committee is endeavoring to determine the influence of each of the following elements on castability: Carbon in relation to iron; phosphorus, silicon, manganese in relation to the iron-carbon alloy; silicon in relation to the iron-carbon-phosphorus alloy; manganese relation to the iron-carbon-silicon, and the iron-carbon-silicon-phosphorus alloys. The investigations on the first three effects now are completed.

Dealing with the influence of carbon, the investigators have arrived at the following conclusions: (1) For a given temperature, castability increases with the carbon content up to 4.3 per cent, and then decreases; (2) For a given interval between pouring temperature and the temperature corresponding to the liquids in the iron-carbon diagram, there is a similar variation of the castability, with a maximum at 4.3 per cent carbon.

The effect of phosphorus on the castability of the iron-carbon alloy is as follows: For a given temperature in the hypoeutectic zone phosphorus increases castability; in the hypereutectic zone, it causes it to decrease.

Influence of silicon depends upon the content of silicon in the primary iron. For primary irons containing 0.20 per cent silicon, castability increases with the silicon content up to 0.30 per cent; it then decreases to a minimum at 0.50 per cent, increases again up to 0.75 per cent, then goes down to a second minimum at 0.95 per cent, after which it increases. It was found that there is no relation existing between graphitization and the minima which was registered for castability of the cast irons.

If the primary iron has a silicon content of more than one per cent, castability again passes a minimum at 0.50 per cent silicon, but the second minimum disappears. It was further found that as the primary iron has a silicon content which is inferior or superior to 0.50 per cent, additions of ferrosilicon will produce or will not produce a sudden decrease of the castability between 0.75 and 0.95 per cent of silicon. The experiments also tend to show that heredity plays no part in these effects.

A. S. M. E. and A. F. A. Hold Second Foundry Practice Meeting at Birmingham

PLANT visitations, a technical session and luncheon and dinner meetings featured the second joint foundry practice meeting held at Birmingham, Ala., Feb. 19 and 20 by the Birmingham section of the American Society of Mechanical Engineers with the American Foundrymen's association co-operating. Registration Monday at the Tutwiler hotel, where the sessions were held, showed an attendance of 146 a number being from outside of the Birmingham district.

Groups were formed on the first day for visiting various plants in the district. At noon a barbecue was served at the city furnaces of the Sloss-Sheffield Steel & Iron Co., with Russell Hunt, sales manager of that company in charge. Plants open for visits during the afternoon included the Goslin-Birmingham Mfg. Co.; Hardie-Tynes Mfg. Co.; Stockham Pipe & Fittings Co.; Tennessee Coal, Iron & Railroad Co.; Woodward Iron Co.; U. S. Pipe & Foundry Co.; National Cast Iron Pipe Co.; Continental Gin Co.; McWayne Cast Iron Pipe Co.; and Thomas Grate Bar Co.

The Birmingham section of the A.S.M.E. held open house at the hotel Monday evening, with James L. McVoy and Kenneth Mann in charge.

Tuesday morning was devoted to plant visitations. A luncheon at noon was presided over by R. E. Brakeman. Dan Dimmick Jr., American Casting Co., Birmingham spoke briefly on the history of the pig iron and castings industries.

H. Bornstein, Deere & Co., Moline, Ill., and a director of the American Foundrymen's association, presided at the technical session on Tuesday afternoon. Two papers were presented, one on "Development in Castings Application Through the Use of Alloys," by E. K. Smith, Electro-Metallurgical Co., Chicago, and the other on "Meehanite Metal" by Oliver Smalley, Meehanite Metal Corp., Pittsburgh. Both speakers discussed their subjects from the viewpoint of the application of castings as engineering materials, as well as indicating features of practice. Interesting discussions which followed the presentation of the papers indicated an active interest in the subjects considered.

John A. Sirnit, Alabama Power Co. and vice president of the Birmingham section of the A.S.M.E., presided at the banquet Tuesday evening. Karl Landgrebe, vice-president of the Tennessee Coal, Iron & Railroad Co., was toastmaster. W. D. Moore, president of the American Cast Iron Pipe Co., and a director of the American Foundrymen's association, spoke briefly.

The principal talk of the evening was presented by Arthur H. Young, vice-president of the United States Steel Corp., in charge of industrial relations. "Industrial relations—dealing with employes in an understanding way for the good of both the employer and the worker—is one of the most important factors in the economic life of any industrial center," said Mr. Young. He drew a picture of old methods of "hiring and firing," contrasting them with present-day procedure of carefully selecting and placing men in even the seemingly most unimportant jobs in industrial various types of plants.

Back in the "old days," he said, there was little profiting from experiences gained from mistakes of workers and foremen themselves. Now, many phases of study enter into industrial life and the economic system of manufacturing centers.

"Safety is one of the most important features of industry in present-day set-up," the speaker said. "For every dollar spent in education along safety lines the manufacturers gain two, not counting the millions of dollars saved annually in loss of others' time and lives.

"Highly advanced industrial relations is the logical evolution of procedure—good business not merely because it is humanitarian, but also because of the economic advantage. There has been marked progress in industrial relations in the past few years."

ADVERTISING PAGES REMOVED

Obituary

JOHN OSMOND, 75, superintendent of the James Smart plant of the Canada Foundries & Forgings Ltd., died at his home in Brockville, Ont., recently following a long illness. He had been connected with the company in an executive capacity for more than 50 years.

John L. V. Bonney, 58, president and treasurer of the Bonney-Floyd Co., Columbus, O., died Feb. 12.

William M. Blackstone, 48, president of the Blackstone Mfg. Co., and a director of the Jamestown Malleable Iron Corp., Jamestown, N. Y., died Feb. 16.

Leander Whelan, 76, pioneer foundryman of the South, died in Birmingham, Ala., Feb. 14. Mr. Whelan took charge of the foundry at the Williams Iron Works, Birmingham, in 1882.

R. J. Fullbright, 57, for 10 years master mechanic for the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., and later engineer for the McWane Cast Iron Pipe Co., Birmingham, died Feb. 13.

E. J. Mohr, president of the Northern Illinois Foundrymen's association and vice president and general superintendent of the Gunite Corp., Rockford, Ill., died Feb. 6, at Madison, Wis.

James Baird, 86, one of the founders of the Baird-Slinger Foundry & Machine Co., Portage, Wis., died Feb. 2. Mr. Baird retired 15 years ago and the company now is known as the Slinger Foundry, Machine & Auto Co.

Edward F. Wickwire, 58, until his retirement a year ago, vice president in charge of sales and engineering, Ohio Brass Co., Mansfield, O., died March 3 at his home in Shaker Heights, O., a suburb of Cleveland.

Guy C. Myers, 52, vice president, F. E. Myers & Bros. Co., Ashland, O., died Feb. 6. He was born in Ashland, Oct. 5, 1881, the son of Philip A. Myers, one of the founders of the company.

Edward G. Elcock, 74, president of the Hansell-Elcock Co., Chicago, died Feb. 12 Mr. Elcock went to Chicago from Belfast, Ireland in 1867 and assisted in organizing the Hansell-Elcock Co., in 1889, becoming president in 1904.

Edward F. McElheaney, 58, assistant treasurer, Central Foundry Co., New York, died Feb. 17 at Muhlenberg hospital, Plainfield, N. J. He had been connected with the Central Foundry Co. for the past 32 years.

George Bollard, 85, veteran employe of the McConway-Torley Co., Pittsburgh, died at Pittsburgh recently. He had been identified with the company for over 40 years, most of which time he had been in the position of storekeeper.

Discuss Steel and Nonferrous Practice

Steel and nonferrous foundry practice were discussed at the monthly meeting of the Chicago Foundrymen's club, held at the Great Northern hotel, March 1. About 75 members attended. David Zeuge, metallurgist, Sivyer Steel Casting Co., Milwaukee, presented a paper on "Better Alloy Steel Castings Through the Use of Alloys and Heat Treatment," discussing this subject from the viewpoints of the foundryman, metallurgist, heat treater and consumer.

Mr. Zeuge emphasized the importance of design in production of alloy steel castings, pointing out by illustrations the necessity of eliminating sharp corners and abrupt changes in sections. Care in the removal of risers and in chipping operations also was recommended. Speaking on the metallurgical phase of alloy castings production the speaker described the three common types of heat treatment, full annealing, normalizing and liquid quenching, with the characteristics of the metal resulting from such treatments. Because of the fine structures obtained, liquid quenching followed by a suitable draw produces the most impressive combination of physical properties either with a low draw if hardness or stiffness is desired, or with a high draw if ductility or shock resistance is wanted, Mr. Zeuge stated, adding that a carbon steel castings, liquid quenched and drawn, may have physical properties superior to those of an alloy steel casting, normalized and drawn. Alloy casting, however, would have better qualities under identical treatment.

The speaker described the composition and characteristics of various types of alloy steel castings, including intermediate manganese, intermediate manganese with an additional alloying element such as chromium, nickel, chromium and nickel, vanadium, molybdenum, or copper, and special purpose steels. It was pointed out that similar physical characteristics may be duplicated by various combinations of alloys, either with the same or a different heat treatment, and that for a definite chemical composition and hardness value liquid quenching and drawing usually produces more impressive physical properties than full annealing or normalizing and drawing. This is especially true for shock resistance.

Figures were presented to demonstrate the effect of various forms of heat treatment on the properties of different alloy steel castings. Methods of producing several hardness ranges in the same castings, such as in a brake drum, gear or sprocket, were described. Discussing castings from the consumers' viewpoint, Mr. Zeuge indicated that without co-operation between the user and the foundry metallurgist in developing chemical specifications a multiplicity of such values may result, leading to an increase in operating complexities. In some instances, however, the consumer is justified in demanding closer limitations of chemical composition than is found in A. S. T. M. specifications, particularly in the case of alloy steels.

W. C. Alvin, foundry superintendent, Imperial Brass Mfg. Co., Chicago, described "Cupola Melting of Nonferrous Metals" as practiced by this company. The cupola used in this melting is similar to that employed in connection with ferrous metals, except that a smoke arrestor is required to eliminate heavy fumes produced. Rammed type of lining was found superior for the melting zone. Metal is tapped at the rate of about 1 ton per hour. Blast averages ½ to ¾-ounce with volume of 350 to 375 cubic feet per minute. Temperature above the tuyeres is about 3100 degrees and at the spout between 2200 and 2400 degrees. Fuel is a pitch coke having fixed carbon of 98.5 per cent, sulphur of 0.4 and ash of 0.7. Fuel costs range from $2.54 to $2.77 per ton of metal melted.

The most practical alloy for cupola melting is the red brass mixture containing no less than 78 per cent copper, with zinc content 5 per cent or lower and lead 10 per cent or lower. Zinc and lead losses in melting are high, while copper and tin losses are negligible.

Plan Industrial Exhibit in Milwaukee

An industrial products exhibit sponsored by the Milwaukee Association of Purchasing Agents will be held at the Hotel Schroeder, Milwaukee, April 3 and 4. Wisconsin products will be featured but the exhibit will also include goods manufactured in other states and handled through local jobbers. There will be approximately 100 booths, exhibits for which will be arranged for by Ole A. Olsen of the A. R, Timberman Corp. and Walter Wenzel of the Vilter Mfg. Co., co-chairman of the arrangements and exhibits committee. Albert Korsan, purchasing agent, Globe Steel Tubes Co. is general chairman.

Incorporates Business

Rapp & Hollins, Chicago, recently incorporated their business and are known as Rapp & Hollins Inc. C. D. Hollins is president, Stanley R. Rapp vice president and A. G. J. Rapp, secretary and treasurer. The company specializes in foundry equipment sales and engineering.

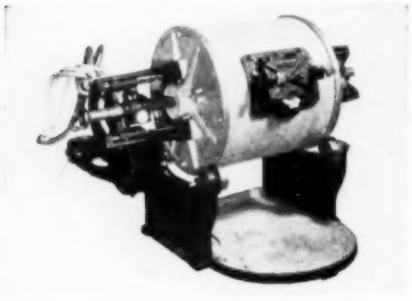
New Equipment

For Foundries

Designs Small Type Rocking Electric Furnace

A new rocking electric furnace of 25 to 100 pounds capacity has been developed by the Detroit Electric Furnace Co., 825 West Elizabeth street, Detroit. The unit is designed for production or experimental melting of small runs of metal, such as iron, alloy steel, copper, brass, nickel, aluminum or precious metals.

The interest of college engineering shops and laboratories as well as important industrial companies in recent metallurgical developments has prompted the development of the small furnace as a part of a standard line of melting units produced by that company. Except for size, the furace is a faithful reproduction of the larger rocking type electric furnaces and is designed to provide the same speed, economy and analysis control as secured in the larger equipment.



The unit is designed for production or experimental melting

The furnace is equipped completely with transformer, control panel, switches, meters and rocking mechanism. It has a nominal electric rating of 20 kilowatts and may be connected to any industrial power supply.

Filter Curtain Runs on Endless Belt

Coppus Engineering Co., 344 Park avenue, Worcester, Mass., has introduced an air filter which employs special wool felt for the filtering curtain. The felt is arranged in the shape of an endless belt running in zigzag fashion over rolls. The edges of the filter curtain are re-enforced by belts which have the double function of keeping the filter curtain stretched in position laterally and of providing an effective seal against passage of dirty air around the edges.

Four bottom rollers are connected by chains and sprockets with a small geared electric motor which is started either by time clock or with a pressure gage. The filter curtain moves slowly over the rolls and passes over a special suction nozzle connected to a vacuum cleaner.

Develops Electrode For Welding Cast Iron

An electrode for welding cast iron by the shielded arc process has been developed by the Lincoln Electric Co., Cleveland. The electrode has a steel core surrounded by a heavy flux coating which protects the arc from gases present in the atmosphere which are injurious to the weld. The electrode is manufactured in only one size, $\frac{1}{8}$-inch, and is used with approximately 80 amperes of current.

Builds Reduction Gear

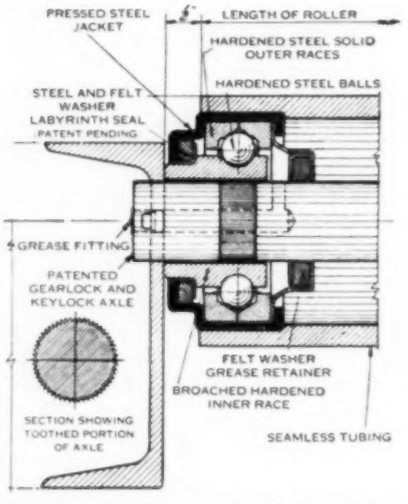
Reliance Electric & Engineering Co., 1042 Ivanhoe road, Cleveland, recently has added single-reduction units to its line of gearmotors. These are used for ratios up to 6 to 1 inclusive. They can be supplied with either alternating current or direct current motors of various types in sizes rated $\frac{3}{4}$-horsepower and up. Multispeed and adjustable-speed motors may be used. Reduction is obtained in a single pair of gears. Substantial feet, cast integral with gear housing, provide a solid support close to the point of maximum torque application. Ballbearings are used throughout.

Electric Heating Unit

To retard chemical action on lead-sheathed units used for heating corrosive solutions, such as pickling and plating baths, the General Electric Co., Schenectady, N. Y., has developed a new heating unit which contains a sheath-wire winding about which is cast a heavy block of lead. The new unit has a low watt density of 13 watts per square inch of immersed surface, a factor which should increase greatly the life of the device.

Lock Ball Race To Axle of Conveyor

Mathews Conveyor Co., Ellwood City, Pa., recently has designed a ball bearing roller for use in either gravity or power-driven roller conveyors in which the inner ball race of the bearing is locked to the axle. The principle of construction is shown in the accompanying illustration.


PRESSED STEEL JACKET
LENGTH OF ROLLER
HARDENED STEEL SOLID OUTER RACES
HARDENED STEEL BALLS
STEEL AND FELT WASHER LABYRINTH SEAL PATENT PENDING
GREASE FITTING
PATENTED GEARLOCK AND KEYLOCK AXLE
FELT WASHER GREASE RETAINER
BROACHED HARDENED INNER RACE
SECTION SHOWING TOOTHED PORTION OF AXLE
SEAMLESS TUBING

The inner ball race is held stationary on the axle

Gear teeth on the inside of the inner race and on the axle are meshed, thus locking the inner race of the bearing to the axle and forming a smooth, even bed of rollers on which to convey heavy objects. The axle is kept from rotating on the conveyor frame, being held in place by a standard cotter key located at both ends, or by an upset key which fits into a corresponding slot in the frame rail.

The outer ends of the bearings are fitted with labyrinth seals so that dust, dirt and grit and other foreign matter cannot work into the bearings. A grease retainer of similar construction is placed on the inner side of the bearing, fitting closely around the axle and forming a grease reservoir.

THE
BRITISH ALUMINIUM
CO. LTD.

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U. S. AGENCY:

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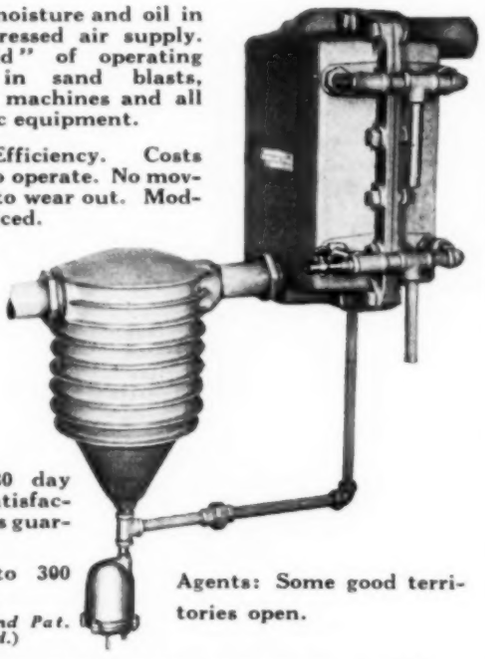
(Dept. F)
30 Rockefeller Plaza New York

RUEMELIN
COMPRESSED AIR DRYERS

Extracts moisture and oil in the compressed air supply. "Gets rid" of operating troubles in sand blasts, moulding machines and all pneumatic equipment.

Highest Efficiency. Costs nothing to operate. No moving parts to wear out. Moderately priced.



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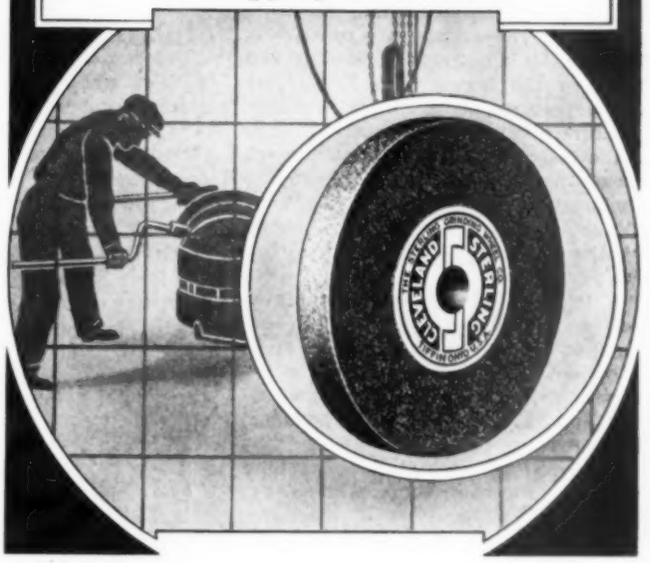
(Patented and Pat. Applied.)

Agents: Some good territories open.

RUEMELIN MFG. CO.
1587 S. First St., Milwaukee, Wis.
(Mfr's Sand Blast and Dust Collectors)

STERLING
STERLITH and STERBON
Snagging Wheels



When your grinder says: "It's a good wheel," he is telling you it cuts fast, it keeps cool, its cutting points are ever keen and it lasts—requisites that are built into STERLING Snagging Wheels.

Constant practical research by STERLING assures you of continuously improved results.

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133 N. Wacker Dr.
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5191 Lorraine Ave.
STERLING ABRASIVES

Instruments Control Temperature and Pressure

Two new control instruments recently have been developed by the Foxboro Co., Foxboro, Mass., one designed to control temperature and the other pressure. These units are practically identical in appearance. A dial and knob on the lower face of the controller permits adjustment of the temperature or pressure within the range of the instrument. An indicating gage above the adjusting knob shows the air presure on the diaphragm motor of the control valve and also shows whether the valve is opening or closing.

A two-inch dial type thermometer may be installed in place of the air gage on the temperature controller. The thermometer is connected to the same bulb as the controller, thus showing the temperature being maintained. The pressure controller likewise may be equipped with a high pressure indicating gage to show the pressure being controlled.

All working parts are integral with or mounted on a cast aluminum base. By removing the set screw in the setting knob and the two screws on the face of the instrument, the entire case can be removed, leaving the interior open to inspection.

Coupling Has Rubber Flexing Unit

Morse Chain Co., Detroit, division of Borg-Warner Corp., has developed a new flexible coupling which uses specially developed rubber as a flexing medium. The flexing member is a complete unit comprising four molded rubber trunnion blocks of special design spaced 90 degrees apart and set, under pressure, into a two-piece steel housing. The pressure trunnion blocks are provided with steel cores or bushings also set under pressure into the blocks. The rubber therefore always is under pressure. All metal parts are rigid and all relative motion is confined to the rubber.

Designs Globe Valve

A new line of heavy standard bronze globe and angle valves recently has been developed by the Kennedy Valve Mfg. Co., Elmira, N. Y. Features incorporated in the design of the valve include: Cadmium plated malleable iron union bonnet ring and stuffing box nut; special design of bearing surface between the stem and the disk holder; use of four guide prongs on the disk holder to prevent tipping or binding of the holder as the valve is opened or closed and a high seat in the body to add to the useful life of the disk.

The valves are made in sizes from ¼ to 3-inch inclusive and are suitable for 150 pounds working steam pressure and 250 pounds working water pressure.

Meter Measures Intensities of Light

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., recently has introduced a light meter for measuring light intensities. The unit may be considered specially useful in checking intensities on dull days when natural light fails and in checking the efficiency of artificial lighting installations.

The unit employs a recently developed photo-voltaic cell which changes

The scale is calabrated accurately in foot candles

light directly to electric current without any auxiliary electrical supply. The cell and the microammeter which measures the cell current are mounted together in a case. The cell is hinged, protecting it against breakage and also protecting the instrument dial and cell when the unit is not in use. The meter has a scale length of 1.8 inches and is divided into 50 divisions. The scale is calibrated accurately in foot-candles and also is divided into sections indicating the minimum amount of light considered satisfactory for various kinds of work and conditions.

Weatherproof Outlet

A weatherproof outlet which will facilitate the use of outdoor lighting fixtures and appliances has been introduced by the General Electric Co., Bridgeport, Conn. The unit is made of cadmium plated brass. The flush plate has a solid rubber pad mounted on the back with a good fit when the device is screwed in place. A cap slips over the plug and screws onto the device, to provide a weatherproof connection.

Portable Tool May Be Used for Sanding

Buckeye Portable Tool Co., Dayton, O., recently has developed a new electric portable tool for polishing and rubbing. The unit operates on 3 phase, 180 cycles, 225 and also 110 volts. The overall length is 16¼ inches, the weight 10½ pounds, and the speed 1800 revolutions per minute.

A sander, identical in construction with the polishing unit, only driven at a speed of 4700 revolutions per minute, also has been developed for sanding or grinding with abrasive disks or cup emery wheels.

A specially designed and constructed high frequency motor is used in these tools. An effective ventilating system is designed to prevent the exhaust from blowing in the face of the operator and at the same time to carry the dirt away from him. A removable insulating pad supporting the stator may be replaced without the loss of the housing.

Company Aquires Turbo-Blower Business

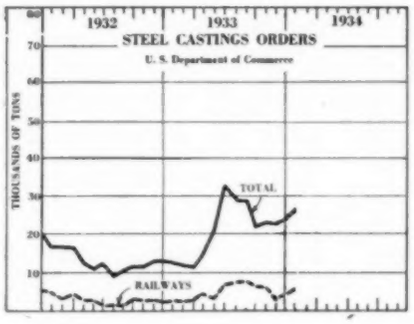
Ingersoll-Rand Co., 11 Broadway, New York, recently acquired the turbo-blower business from the General Electric Co., Schenectady, N. Y., and will consolidate it with its own turbo-blower department. This acquisition permits the Ingersoll-Rand Co. to supply blowers and centrifugal pipe compressors for a wide variety of uses. That company has manufactured blowers of medium and large capacities for pressures ranging up to 100 pounds. The line now offered by Ingersoll-Rand includes low pressure units for a wide variety of uses, including ventilating and air conditioning systems, blowing cupolas, atomizing oil for furnaces, etc.

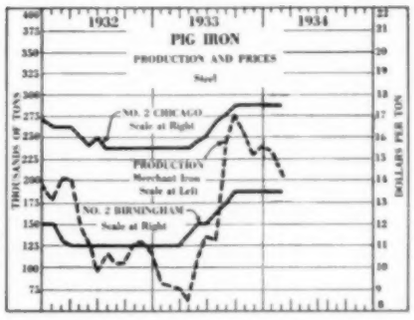
Manufacturing equipment previously employed by the General Electric Co. has been moved to the Ingersoll-Rand Co., Phillipsburg, N. J. Sales activities will be directed from the New York office.

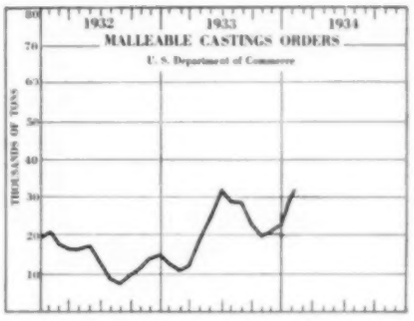
To Handle Sales In Pittsburgh District

David Adams has been appointed Pittsburgh district sales manager of the Falk Corp., Milwaukee, succeeding W. O. Beyer, who recently resigned to become a member of the Pittsburgh civil service commission. Mr. Adams has been with the Falk Corp. for the past 4 years in the sales department at Milwaukee and previously had been with National Malleable & Steel Castings Co., Sharon, Pa., and W. A. Riddell Co., Bucyrus, O., in charge of foundry and sales. He was graduated from Rensselaer Polytechnic institute in 1914.

ADVERTISING PAGES REMOVED







Foundry Activities

Reflect Industrial Trends

JENSEN BROS. MFG. CO. Fourteenth and Pacific streets, Coffeyville, Kansas, is equipping a foundry for the production of gray iron castings. While most of the new equipment will be housed in the main building already erected, a 2-story, 20 x 55-foot building will be built for the core and cleaning department. Most of the equipment has been purchased. The company will also operate a pattern shop and engineering department in connection with the foundry.

* * *

John D. Ward Foundry, Elmira, N. Y., recently was damaged by fire with a loss estimated at $15,000.

* * *

Auburn Foundry, Auburn, Ind., recently has been incorporated by John E. Douglas.

* * *

Model Brass Co., Dallas, Tex., has been incorporated to manufacture nonferrous castings by Moise Corf and associates, Dallas, Tex.

* * *

American Furnace & Foundry Co., Milan, Mich., resumed production Feb. 5, after being closed since the middle of November.

* * *

Wilson Foundry & Machine Co., Pontiac, Mich., a subsidiary of the Willys-Overland Co., recently resumed operations.

* * *

Spring City Foundry Co. plant at Spring City, Pa., was practically destroyed by fire on Feb. 15 with a loss estimated at $125,000.

* * *

American Brake Shoe & Foundry Co., South San Francisco, Calif., opened its new plant Jan. 29. The main foundry is 200 feet long and 135 feet wide. Officers of the South San Francisco plant are A. L. Clark, president; Charles J. P. Hoehn, vice president; E. W. Lindman, secretary-treasurer; and C. A. Erickson, superintendent.

* * *

United States Pipe & Foundry Co., Burlington, N. J., recently reported that it was beginning to feel the impetus of federal aid for cast iron pipe projects.

* * *

Marshalltown Mfg. Co., Marshalltown, Iowa, recently renewed its articles of incorporation. The officers are as follows: E. L. Williams, president and treasurer; D. V. Williams, vice president; R. S. Wieneke, secretary and C. G. Blodgett and G. F. Roupp, with the officers, members of the board of directors.

* * *

Alexandria Metal Products Co., Central avenue, Alexandria, Ind., is consolidating its two planes in the main works, the foundry department being moved to the machine shop plant.

* * *

American Radiator & Standard Sanitary Corp., New York, has formed an air-conditioning division under the direction of Fowler Manning, formerly president of L. C. Smith & Corona Typewriters, Inc.

* * *

Central Foundry Co., Marshalltown, Iowa, recently reincorporated for 20 years with a capital stock reduced from $100,000 to $10,000. Merritt Grenne is president and W. B. Wood, secretary.

* * *

Titusville Iron Co., Titusville, Pa., will build an addition connecting its present shops on each side of South Washington street, which has been vacated by the city council for that purpose.

* * *

Dayton Malleable Iron Co., Dayton, O., is employing about 500 men pouring, 125 tons weekly. The company recently purchased the equipment of the Elite Mfg. Co., Ashland, O., manufacturers of automobile jacks.

* * *

Gray iron foundry operations increased 29.1 per cent in January over the output in December in the Philadelphia Federal Reserve district, according to a report of the industrial research department of the University of Pennsylvania. Malleable iron foundries report an increase of 53.3 per cent and steel

RAW MATERIAL PRICES
March 7, 1934

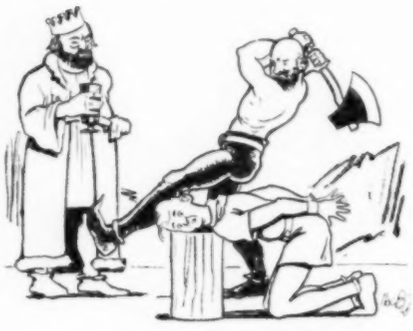
Iron	
No. 2 foundry, Valley	$17.50
No. 2 Southern, Birmingham	13.50
No. 2 foundry, Chicago	17.50
No. 2 foundry, Buffalo	17.50
Basic, Buffalo	16.50
Basic, Valley	17.00
Malleable, Chicago	17.50
Malleable, Buffalo	18.00
Coke	
Connellsville beehive coke premium	$5.00
Wise county beehive coke	3.50 to 4.25
Detroit by-product coke	8.00
Scrap	
Heavy melting steel, Valley	$14.00 to $14.50
Heavy melting steel, Pitts	14.00 to 14.50
Heavy melting steel, Chicago	11.75 to 12.25
Stove plate, Buffalo	10.25 to 10.75
Stove plate, Chicago	7.50 to 8.00
No. 1 cast, New York	8.50 to 9.00
No. 1 cast, Chicago	9.00 to 10.00
No. 1 cast, Pittsburgh	13.00 to 13.50
No. 1 cast, Philadelphia	12.00 to 13.00
No. 1 cast, Birmingham	9.00 to 10.00
Car wheels, iron, Pittsburgh	12.50 to 13.00
Car wheels, iron, Chicago	12.25 to 12.75
Railroad malleable, Chicago	12.50 to 13.00
Malleable, Buffalo	12.75 to 13.25
Nonferrous Metals	**Cents per pound**
Casting copper, refinery	8.00
Straits tin	52.65
Aluminum, No. 12, producers	18.00 to 22.00
Aluminum, No. 12 remelt, Cleveland	15.50 to 16.00
Lead, New York	4.00
Antimony, New York	7.50
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.40

foundries an increase of 20.1 per cent. Increases were widely distributed throughout the industry.

* * *

Commonwealth division of the General Steel Castings Corp., Granite City, Ill., closed for 3 years, will open with 1000 employes about April 1, according to a recent announcement of Earl F. Varnum, assistant works manager.

Faked Foundry Facts



A-Nnealing Kiln

New Trade Publications

HANDLING EQUIPMENT—A new 64-page illustrated catalog and engineering data book No. 1240 recently has been issued by the Link-Belt Co., 910 South Michigan avenue, Chicago, on equipment for mechanical handling, screening, sizing, washing and preparation of sand and other nonmetallic minerals.

GEAR MOTORS—A leaflet describing its single reduction gear motors for direct or alternating current has been published by the Reliance Electric & Engineering Co., Cleveland.

CONDENSATION—Nason Mfg. Co., 71 Fulton street, New York, recently has issued catalog No. 33 discussing various types of traps which may be employed in the solution of condensation problems.

REFRACTORY CEMENT—Harbison-Walker Refractories Co., Pittsburgh, has issued two bulletins discussing the use of refractory material for bonding fireclay brick. The bond is shipped mixed and is ready to use after stirring in the drum.

GRINDING MILLS—Hardinge Co., York, Pa., has published a new bulletin briefly outlining the principal features of its pulverizing and grinding mills, air classifiers, coal pulverizers, rod mills, thickeners and filters, constant weight feeders, scrubbers, counter current classifiers, dryers, etc.

PATTERN PLATES—National Aluminum Co., Racine, Wis., recently has published a bulletin illustrating and describing its line of cast aluminum pattern plates of both flat and offset design. Extreme accuracy of the plates is stressed and the tables show available sizes and prices.

PAINT—A paint which provides two coats with one stroke of the brush, a black anticorrosive base and an aluminum surface, is described in a bulletin recently issued by the Quigley Co. Inc., 56 West Forty-fifth street, New York. A variety of illustrations show typical applications for that type of paint.

COUPLINGS—A coupling which operates centrifugally as an automatic starter is described in bulletin No. 500 recently issued by the Falk Corp., Milwaukee. Information is given on the use of the coupling for direct connection, for overhung drives, and for dual drives, as well as details of construction.

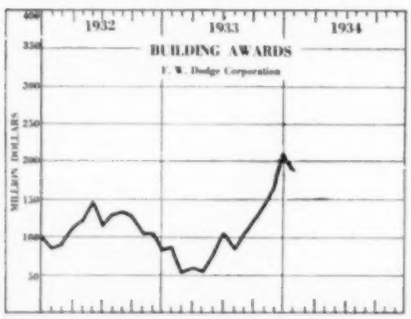
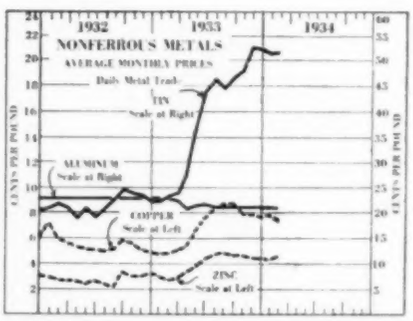
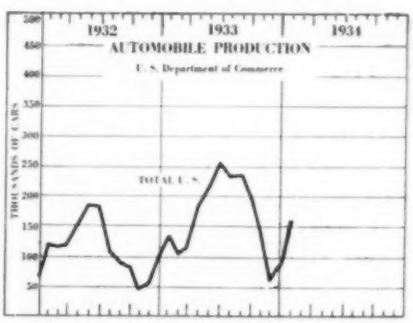
HEATING FURNACES—Sullivan Machinery Co., 400 North Michigan avenue, Chicago, has published bulletin 74-D on its drill steel furnaces. Illustrations show several types of furnaces, sectional views, typical installations, methods of brick assembly and a brick cutter for fitting and repairing linings.

RESEARCH—"Control of Industrial Research" is the subject of a bulletin recently issued by the Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison avenue, New York. The material presented deals with the organization and administration of an industrial research department, and represents data collected from 45 prominent manufacturing organizations.

MIXERS—Scientific mixing is the title of a 36-page bulletin recently prepared by the Lancaster Iron Works Inc., Lancaster, Pa. The bulletin describes various types of mixing machines that the firm manufactures for numerous applications in the foundry, abrasive, ceramic, chemical, concrete, and glass fields. The mixers have a slowly rotating pan moving counter to one or two rapidly rotating mixing stars.

PUMPS—Roots-Connersville Blower Corp., Connersville, Ind., has issued bulletin 60-B10 describing a line of rotary pumps built on the two-impeller principle, with two and three-lobe impellers, depending upon the type of service to which they are applied. The pumps are built for heavy duty service including the handling of viscous liquids, for producing vacuums, handling air and liquid simultaneously, etc. Any standard driving arrangement is available and illustration shows single pulley, direct coupled and V-belt pumps operated by gasoline engines and electric motors.

FOUNDRY CHAPLETS—Smith & Richardson Mfg. Co., Geneva, Ill., has issued a new catalog No. 117 showing a wide range of products and compiled with the idea of giving foundrymen all the information possible about chaplets and tin forms of all types used in molding operations. Line drawings illustrate the application of hinge tubes, dovetails, cover lugs, screw shells, catches, lug tins, babbitt anchors, skim gates, etc. A compact treatise deals with the phenomena of liquid pressure as applied to cores. Instructions and rules are given for selecting and applying chaplets correctly.

REFRACTORY CEMENT—Atlas Lumnite Cement Co., Inc., 208 South LaSalle street, Chicago, recently has published a bulletin on making an application of refractory concrete. The cement with crushed or ground refractory material (aggregate) will harden like concrete with the addition of water, developing a high strength within 24 hours. The publication shows a chart illustrating the refractory values of various combinations of the cement with other refractory materials, and points out that the lining may be monolithic or precast refractory units such as brick and special shapes.

AUTOMATIC CONTROL—Control equipment which maintains a constant condition with respect to pressure, draft, differential pressure, volume, rate of flow, water level, humidity, temperature, speed of rotation and many other circumstances is described in considerable detail in a recent bulletin of H. A. Brassert & Co., 310 South Michigan avenue, Chicago. The publication presents a description of the jet pipe regulator which operates the system of control and also many combinations and accessories which are used for several conditions which must be controlled at once.